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THE IRON AGE

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MARCH 14, 1940

ESTABLISHED 1855

Vol. 145, No. 11

Unlimited Frontiers

I HAVE heard some of the younger men in our industry complain that their grandfathers got all the breaks. That they lived and worked while our frontiers were still expanding and in times when a man who was able and willing to open new territory could make a fortune, a comfortable living or at least a job.

Men who think like that today are on the wrong track. They are not altogether to blame for being there, however, since so many of our prominent public figures—mostly zeros themselves when you sum them up—are dinning that defeatist philosophy in our ears day and night.

Grandfather did have an advantage. There were no New Dealers in his day who made him think that his fellow citizens owed him a living. He knew that it was up to him to sink or swim, so he proceeded to learn to swim without a teacher. Grandpa cultivated initiative and used it.

Grandpa did open new physical frontiers. He fought the Indians, worked 18 hours a day, opened the West, squatted or settled wherever the land offered him an opportunity. When he found it would not yield him a living, which was often, he moved to another place, under his own steam and not on a Government ticket.

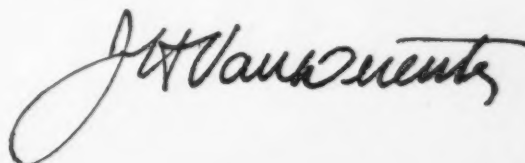
Grandpa sweated in summer and froze in winter. He did not have steam heat or air conditioning to heat or cool him. He adapted himself to his times and his environment. And his reward, by and large, was meagre. Usually it was a short life and a hard one. Harder than most of our young men of today could endure.

Well, they don't have to. These are different times and our physical frontiers are mostly all opened up except in remote places like Alaska. But there are other frontiers to be opened up that are unlimited. Unlimited as to their extent and also as to the reward to be gained by those who open them.

The opening of our physical frontiers gave us agricultural products and raw materials such as coal, iron, copper and gold. Gave us so much of these basic materials that there are no limits now for the new pioneers who discover new ways to use them.

Any bright young man of today who is willing to emulate his grandfather in initiative and determination and who will work as hard with his head as grandfather worked with his hands will find the new frontiers to be far richer in reward than the old ones were.

But to get that reward, he will have to fight the Indians. The Indians of defeatism, discouragement and the hope of something for nothing.



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2. Second draw. Draw to 4½ inches.



3. Trim flash.



4. Embossed, punched and drilled.

Interpretation of TEST RESULTS

By O. W. McMULLAN
Youngstown Sheet & Tube Co.,
East Chicago, Ind.

INTERPRETATION of test results must necessarily involve consideration of the application of the steel or other materials in service. One set of properties might be entirely suitable for one type of service but a distinct failure might result in another application. Neither will one test, nor frequently more than one, if not properly chosen, always serve as a satisfactory measure of the suitability of an article for the service intended.

Merely to list all of the tests that have been applied to steel products would take more time and space than would be justified since many are suitable for specific applications only. The most that can be done is to discuss the more common tests and include some of a more special type to illustrate the value of results obtained from tests to suit the particular conditions.

In the final analysis, the performance of the steel during fabrication and the history of the finished article or assembly in service are the only complete tests that omit unanticipated factors that lead to erroneous interpretation of results. Very probably tests were originated to prevent the repetition of previous failures of finished products. To these have been added numerous other tests such as those to determine suitability for various operations during fabrication, uniformity of product not necessarily in the finished condition, comparison of different compositions, suitability for new developments requiring special properties not previously employed, etc. Most of these might still be considered incidental to the desire to manufacture a product that will

TESTS alone are of little worth in determining the suitability of a material for a given application—the proper tests must be chosen and the results interpreted correctly. The different physical tests, their characteristics and the results obtained for various metallic articles are all treated herein, in this the first section of a two-part article.

not result in undue failure in service. It is perhaps the failure to keep this original purpose in mind that has resulted in the misapplication of tests and misinterpretation of test results in so many cases. A number of such misinterpretations will be mentioned later in connection with the different types of tests.

In general it may be said that the best test for a finished product outside of actual service is one which tests the full size part, preferably assembled if part of a unit, under conditions approaching as nearly as possible those obtaining in service. Frequently this can be done but in other cases there are limitations and difficulties in the way. Parts may be so large that they could not be tested without sectioning, the design might require special equipment not available or the number of parts of one design would not justify the cost of destruction of any of them. Many of the conditions prevailing in service may be unknown, or if known,

difficult to reproduce in accelerated tests.

It is certain that our engineers are unable to calculate the stresses that occur in assembled units under dynamic loads and frequently the effect of deflection on point of load application is not taken into consideration. The designer, of course, cannot be held responsible for intentional overloading in service beyond the rated capacity. No doubt too, tests on complete assemblies can lead to erroneous results. An instance in mind is that of one of the large automotive companies which several years ago thoroughly tested its radiators for cooling capacity by driving cars in the dry, hot, Southwest States. Yet, after selling them to the public, many complaints of overheated radiators came in from New England States. Similar complaints have escaped proving ground tests. The human factor from the test operator, the driver in these cases, enters such tests also.

The lack of suitable test methods or the uncertainty in interpretation of results may be offered to explain why, when the final decision is made in design or procedure, frequently more reliance is placed on copying, with suitable modifications, an article or process that has proved successful in the past, than is placed on the results of calculation and standard tests. That method in reality follows the natural evolution of all human endeavor. Neither can it be denied that such a procedure carries with it many of the mistakes and needless precautions of the past that might be eliminated by

suitable tests. Testing of a complete article or assembled unit, of course, is really only a test of the weakest unit and testing by comparison of one part of a unit with another could lead to a vicious cycle. The writer has been told that the front axle of one of the early automobiles was designed by making changes in it until the car could be driven against a brick wall with such force that the tires would rupture before damage to the axle would result. While it is easy enough to interpret the comparative strength of the tires and axle from the results, what would eventually happen if the next step should be to build tires that would not rupture before the axle failed?

Quality and Uniformity

Tests in general might be divided into those which determine the quality and uniformity of product in a more or less unfinished state, regardless of subsequent fabricating or service requirements, and those which determine suitability for more specific fabricating operations and types of service. Quality and uniformity tests include chemical analyses, microscopic examinations, grain size and hardenability, but these are beyond the intended scope of this paper. It is the intention to discuss only physical tests, although chemical means may be used to make visible certain physical characteristics.

ETCH AND FRACTURE TESTS: Etch tests are widely used to check for the presence of blow holes, large inclusions, porosity, dendritic and other patterns, internal ruptures, etc., in blooms, billets, bars, castings and other steel and iron products. The deleterious nature of several of these defects is self-evident but the effect of others is more obscure. A dendritic pattern is one of the latter and there exists a difference of opinion as to its effect. While it is more pronounced in some types of steel than in others, dendritic pattern in wrought products frequently indicates that a rather limited amount of hot work has been done and the pattern probably will be eliminated if further hot working, such as forging, is to follow. When the pattern is due to, or accompanied by, carbide segregation in high carbon steels, such as high speed steel, it is definitely harmful to mechanical properties.

Thermal cracks, internal ruptures, or bursts as variously named, also are harmful to mechanical properties but they too may be eliminated by subsequent hot work which welds them shut. Blow holes and porosity due to gas also weld in hot working if the

surfaces do not become contaminated. Inclusions of a size to be visible in a macro etch are usually considered harmful. Banding or flow lines in forgings are more harmful when in such a direction as to receive transverse stresses. The adverse effect of defects in castings depends greatly on their nature, size and location in regard to thickness of section and intensity of stress.

Etching is used also to bring out surface defects such as seams, laps and grinding cracks. Sulphuric, hydrochloric and other etching acids that liberate hydrogen may actually develop cracks where none existed, prior to etching to show grinding cracks in a highly hardened steel. Cracks thus developed probably follow lines of high internal stress. Nitric acid, on the other hand, will make visible only those cracks actually present before etching, and if the etching is deep enough will entirely remove shallow cracks.

Fig. 1 illustrates how etching tests may be used to reveal surface defects produced during fabrication. When copper is present in steel, surface checks occur when the steel is hot worked. The samples shown were forged down to bars from small castings. They are low alloy steels of about 0.40 per cent carbon and contain 0, 0.35, 0.70 and 1.00 per cent copper in that order from left to right. This effect can be diminished or eliminated by the addition of nickel in amounts equal to or greater than the amount of copper present.

Fracture tests may be used to determine the uniformity and quality of metal products. Fracture may be either parallel or transverse to grain flow. Sometimes specimens are hardened before the test is made. In general, the fracture reveals the same kind of information as the etch test, but the etch test is usually more comprehensive.

Many of the tests described under the next heading are used for determining quality and uniformity also.

Fabrication and Performance

The tests to be described may be used to determine characteristics suitable for fabricating operations or performance in service, or both, and for the most part no attempt will be made to classify them on that basis. It is the writer's opinion that the more usual types of service to which steel products are subjected require tests revealing one or more of the following properties. Tensile strength, shock resistance, notch sensitivity, and wear resistance. Endurance tests determine

the same characteristics under repeated loading. More special service applications require knowledge of corrosion resistance, creep rate at high temperatures, etc.

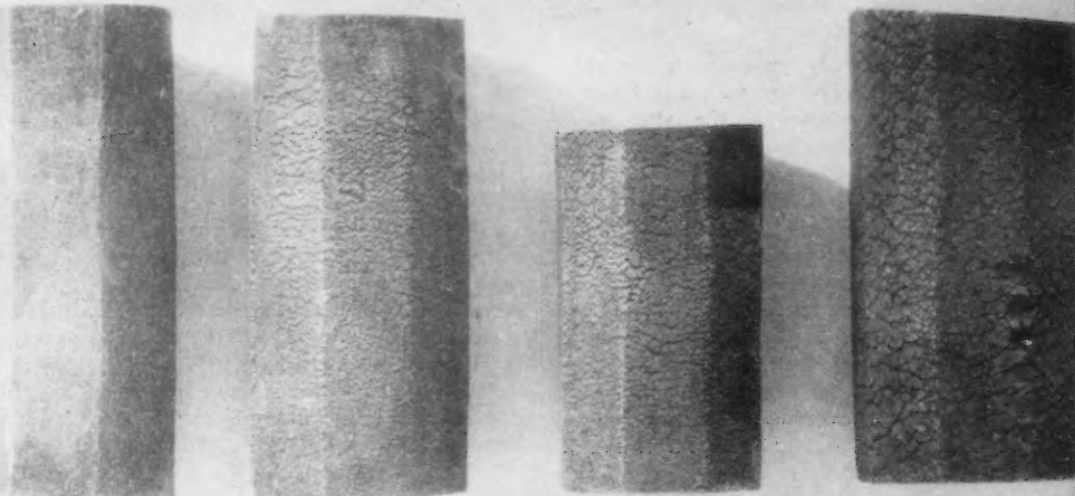
TESTS FOR TENSILE STRENGTH: The tensile strength can be measured in a variety of ways. The standard tensile test specimen machined to 0.505-in. diameter is probably the most familiar and widely used—also the results are widely misinterpreted. It is common practice on larger specimens to take the specimen from a point half way between the center and surface. Since many machine and structural parts are stressed in bending or torsion rather than simple tension, the stresses developed in service are proportional to the distance from the neutral axis. In such cases tensile values at the halfway point may have little value.

The tendency toward lower alloy shallow hardening steels has resulted in products with a surface hardness of 400 to 500 Brinell and perhaps 250 Brinell in the center, as, for example, certain automotive axle shafts. In that case the hardened shell, which really determines the strength of the shaft, may be less than 1/4-in. thick. This is too thin from which to machine a test specimen, but a test taken from any other location is of little value. To machine a test specimen first and then harden it brings in the problem of warpage and also sets up an entirely different internal stress distribution. Some other test, such as a torsion test of the complete shaft, is of far more value under the circumstances. On the other extreme, the properties near the center of a large piece may be of most interest when machining is done after heat treatment, as, for example, drilled and splined holes, deep slots, etc.

The surface condition or finish may have a pronounced bearing on tensile properties. Sucker rods are usually put into service with their surface in the hot rolled condition. Both ductility and tensile strength are affected by decarburization and surface imperfections. A tensile test on a short length of bar is more suitable than one that has been machined down to standard size. It must be kept in mind in interpreting results, also, that surface scratches, sharp corners, threads, etc., decrease allowable stresses. Threaded bolts, studs, etc., should be tested in full size finished products if possible.

The writer has seen butt welds tested by cutting strips across the weld and pulling them in a tensile machine in cases where service conditions

FIG. 1—Etch tests show surface checking developed by hot working of copper containing steels. The samples shown (natural size) contain 0.40 C; and 0, 0.35, 0.70 and 1.00 per cent copper from left to right.



imposed practically no stresses on either the weld or material in the direction tested. While the tensile test did serve as somewhat of a check on the uniformity of the welder's performance, a bend test on a wider specimen would be quicker, cheaper and more informative. The tensile test may offer definite figures by a standard method, but definite percentages of an unsuitable standard do not help much in applying results.

By means of the tensile test, the elastic limit, yield point, elongation and reduction of area are obtained also. The foregoing remarks apply to the interpretations to be placed on these results as well as on the maximum tensile strength. The elastic limit is of value since it represents the safe load without permanent deflection. Its usefulness is diminished by the fact that it is more difficult to determine and, especially on heat treated steels that have been given a low draw, its location may depend on the sensitivity of the instrument used and the care taken in making the readings. It is also more affected by internal stresses present which may be altered by removal of material during machining or additional stresses may be set up by the machining, stamping or other method used to form the test specimen. The elastic limit as determined may therefore be even further in error from that in the article as a whole than either the tensile strength or yield point. Both the nature of the yield point and its numerical value are of importance in forming operations on flat products. High yield point

elongation and dropping of load carrying capacity result in local extension and stretcher strains in contrast to more uniform flow of metal when the sharp break in the curve does not occur.¹

The yield point, in connection with other properties such as elongation and tensile strength, is important in forming operations and in static structures, as some yielding may permit a redistribution of stresses and a more stable structure if rupture does not occur. Yield point may be of little or no interest in dynamic parts. Close dimensional maintenance on many moving parts is necessary and they would be valueless if the elastic limit were exceeded; also, any definite yield point is non-existent in most heat treated alloy steels and many carbon steels as well. Reduction of area and elongation are measures of the ductility of steel. They are important in connection with redistribution of stresses, as already mentioned. While ordinarily thought of only in connection with stresses that cause permanent deformation, they should not be overlooked elsewhere. Sharp notches, threads, etc., concentrate stresses, but steels with high elongation and reduction permit better load distribution and minimize danger of sudden failure. Reduction of area has been reported as a measure of machinability by Janitzky.² At a given Brinell hardness the machinability becomes poorer with increase in reduction of area.

It has been found that, in the common steels of uniform quality, tensile strength varies directly with the Brinell hardness regardless of the composition of the steel. The proportion varies a little at different hardness levels but the tensile strength averages about 500 times the Brinell hardness. It is possible to establish a

similar relationship between tensile strength and other hardness values such as Rockwell hardness provided the material is uniform in hardness. Hardness checks therefore offer a quick and easy means of determining the approximate tensile strength and may apply to surface layers and parts of a size from which tensile tests could not be taken. Also they may be non-destructive as compared with a destructive tensile test.

Bend tests and torsion tests may be substituted for standard tensile test specimens to determine tensile strength. Unless the steel is highly hardened, however, torsion failure is more apt to occur in shear. The usual formula for bending loads gives unit tensile stress values for outside fibers considerably higher than maximum values obtainable from standard tensile specimens. Because of uneven load distribution with maximum stress on the surface, bend test specimens may be more sensitive to surface conditions than tensile tests and this should be remembered in selecting samples, choosing the direction of loading and interpreting results.

Bend tests and specimens, with perhaps the exception of cast iron, have not been standardized to the extent that tensile tests have been. The capacity of testing machines is such that larger specimens can be used for bend and torsion tests frequently making possible the use of full size specimens such, for example, as automotive front or rear axle parts or assemblies in bending or in torsion. The interpretation of results from standard bend or torsion test specimens machined out for test purposes only is subject to the same errors mentioned in connection with standard tensile tests.

SHOCK RESISTANCE: The purpose of impact tests is to study the effect of rapid application of load. While the

¹ "Some Factors Affecting the Plastic Deformation of Sheet and Strip Steel and Their Relation to the Deep Drawing Properties," by Joseph Winlock and Ralph W. E. Leiter, Transactions A.S.M., Vol. XXV, No. 1, p. 163.

² "Taylor Speed and Its Relation to Reduction of Area and Brinell Hardness," by E. J. Janitzky, Transactions A.S.M., Vol. XXVI, No. 4, p. 1122.

more commonly used specimens are notched, notched bar and impact tests are not synonymous as the latter may be used on unnotched specimens and any rate of load application may be employed with notched bars. Since the desire in design is to keep away from notches and sharp corners, notched impact tests usually are not designed to simulate service conditions. They should be interpreted as tests to establish the relative values of various compositions, heat treatments, grain sizes, case depths, etc., under shock loads and the sensitivity of the various ma-

terials to surface imperfections. An example is that of testing automotive ring gear teeth by clamping the gear rigidly in a fixture and dropping a known weight from measured heights so as to strike a tooth at the pitch line. The intention is to indicate what shock the gear will stand in service. Results are difficult to interpret since shocks of such severity do not occur in service because of the cushioning effect of rubber tires, wind-up in shafts, etc. They can be of value in comparison against a standard to test faulty design, internal stresses, case depths and imper-

are those exhibited before failure occurs, would it not be reasonable for many applications to develop tests that would show what steel or iron products can withstand without failure rather than determine the energy absorbed when failure does occur? Thus highly hardened silico-manganese steels give a good account of themselves in shear blades, chipping chisels, etc., where shock loads are very severe, yet the usual destructive tests would show low impact values. The high elastic limit of such steels permits relatively large elastic distortion without failure.

NOTCH SENSITIVITY: As already mentioned, notched bar tests are used for various rates of load application and for different kinds of tests such as impact, bend, endurance, torsion, etc. The effect of the notch is to localize or raise stresses, and this becomes more severe with the sharpness and depth of the notch. Failure occurs when the cohesive strength is exceeded before deformation sets in. All steels break in a brittle manner if the notch is severe enough. The notch may therefore be varied to test the relative notch sensitivity of steels or treatments that make satisfactory products as to tensile strength and other properties. The test is especially applicable to designs necessitating sharp notches such as threads and to service conditions that may develop surface stretches, nicks, etc. Somewhat akin to the notch effect is that of protruding fins, sharp corners, etc. These too may serve as local stress raisers if present in a critical location, and therefore be the point of origin of fatigue and other failures.

Fig. 2 shows a fatigue failure of a grooved shaft driven by a key. The large crescent shaped fatigue failure originated at the bottom of the circumferential groove and progressed inward. Another small fatigue fracture started at the sharp corner of the keyway. Both conditions, the groove and the sharp corner, served as stress raisers.

Materials of high damping capacity are said to be less sensitive to the influence of surface notches. Damping tests measure the rate of damping out of vibrations. A common test procedure is to set up torsional vibrations in a cylindrical specimen. Stresses are kept below the elastic limit. Damping is the result of dissipation of energy in the form of heat.

Ed. Note:—Next week the author will conclude with discussions of hardness and wear resistance, torsion tests, endurance tests, bend, shear, compression, cupping and high temperature tests.



FIG. 2—Progressive fractures in a shaft stressed in torsion. Grooves and sharp corners act as stress raisers. At 2 diameters.

terials to surface imperfections. Preliminary treatments must be considered as, for example, only a relatively few degrees difference in drawing temperature not appreciably affecting other properties might cause considerable difference in impact results. Also the temperature at which the test is made is important, for wide fluctuations may occur in impact values within a rather narrow temperature zone. The minimum temperature to be reached in service should govern the interpretation of results. Since impact specimens are smaller and of simpler design than the tensile specimen and the notch can be located in any side, it is possible to get tests near the surface on specimens cut from shallow hardening steel.

Impact tests have been applied to test specimens of many sizes and shapes including finished parts. Results in such cases can be applied only

to specific designs. Preliminary treatments must be considered as, for example, only a relatively few degrees difference in drawing temperature not appreciably affecting other properties might cause considerable difference in impact results. Also the temperature at which the test is made is important, for wide fluctuations may occur in impact values within a rather narrow temperature zone. The minimum temperature to be reached in service should govern the interpretation of results. Since impact specimens are smaller and of simpler design than the tensile specimen and the notch can be located in any side, it is possible to get tests near the surface on specimens cut from shallow hardening steel.

A more recent development in impact testing is the torsion impact test. Small specimens have been used for single blow tests of hardened tool steels, and the results indicate that greater sensitivity to the effects of low draw temperatures is shown by the torsion test. This is said to aid in the selection of proper heat treating procedure for tools.³ Large flywheel types of machines have been constructed for single blow tests of small shafts or standard specimens one inch in diameter. Even these tests do not closely simulate service conditions as failure in use is more likely to occur in fatigue rather than from a single blow.

The shock resistance ratings of various steels may be of a different order, when tested under blows that do not cause permanent distortion, than they would be if tested by blows that produce permanent distortion or fracture. Since the only useful properties

³ "Interpretation of Torsion Impact Properties of Carbon Tool Steel," by G. V. Luerssen and O. V. Greene, Transactions A.S.M., Vol. XXIII, No. 4, p. 861.

Theory and Practice of BASIC OPEN HEARTH SLAG CONTROL

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and Inspection, and Research Metallur-
gist, Respectively, Wisconsin Steel
Works, International Harvester Co.*

THE problems of slag control occupy more and more of the attention of open-hearth men, now that analyses of steels are becoming increasingly rigorous. These problems are treated in this article. During the past three weeks the authors have covered slag formation, transfer of iron oxides, measurement of oxidizing power, elimination of carbon from the bath, rate of oxidation of slag and bath, effect of temperature, elimination of silicon and manganese, and removal of phosphorus. Herein, as a conclusion, some observations are made on the removal of sulphur, and extensive details are presented on "practical slag control."

REMOVAL OF SULPHUR: It is not the intention of this paper to discuss sulphur removal in any detail. Sulphur is not so much a problem in forging steels as it is in the production of rimming steels for severe deep-drawing application, particularly in view of the present trend toward deliberate specification of sulphur contents of 0.055 to 0.065 per cent for better machineability in high quality forging and alloy steels.

It is well known that any extensive removal of sulphur from liquid iron or steel requires a highly basic slag, high temperature, and reducing condi-

tions. The basic open hearth process operates at all times under oxidizing conditions, and its ability to remove sulphur is therefore limited and somewhat uncertain. By far the best practice is selection and control to insure low sulphur scrap, low sulphur iron, and low sulphur fuel. When sulphur troubles are encountered, it is necessary to abandon otherwise desirable principles of slag control in favor of high basicity and to increase time and temperature, or to divert the heat to some less exacting specification if this is possible.

The function of practical slag con-

trol of quality killed steel is to arrive as rapidly as possible at the end of the refining period of heats, which is of course the point at which furnace deoxidation starts, with a minimum of oxides in the steel bath. At the same time this minimum should be obtained without an excessive build-up of oxides in the slag which may possibly be transferred to the bath during the furnace deoxidation. The primary reason for desiring low oxide content in the steel bath at this point is that in the basic open hearth process the furnace deoxidation must be carried out by the use of reducing elements, such as manganese, silicon and aluminum, which form solid or liquid reaction products in the bath. In order to produce satisfactorily clean steel, these reaction products must be almost entirely removed by allowing them to float to the surface of the bath. While this process of gravity separation is taking place, more reaction products are being formed from the oxides diffusing into the bath from the slag, and therefore the time which can be allowed for this gravity separation is



Pouring a slag pancake test.

definitely limited. If the FeO content of the bath is low, relatively few non-metallic inclusions are formed during furnace deoxidation, and, of importance from a cost standpoint, the amount of deoxidizers required to achieve the desired FeO content of the steel leaving the furnace will be reduced.

The Refining Period

In the previous text an attempt has been made to show that the basic open hearth process operates in accord with definite laws of chemical equilibrium. *Any artificial disturbance of the natural approach to equilibrium, created by manipulation of the slag, will be purely transitory in effect, and when correction is once started by the furnace system it will proceed at an accelerated rate until the same conditions have been established as would have resulted without the application of control, unless the readjustment is stopped by the tapping of the heat or by further manipulation which will postpone the adjustment only tempo-*

rarily. The only exception to this statement is the accelerated removal of carbon during the early part of the refining time by the use of ore, because this reaction is rendered non-reversible by the removal in the flame of the carbon monoxide formed. Even in this case, the same conditions of iron oxide in the slag and bath and rate of carbon drop will be established at some lower carbon content as would apply if the same carbon content were reached without ore.

Since any unbalance during the refining period of the natural striving of the bath-slag-flame system toward equilibrium does not result in any lasting beneficial effect, it would seem more to the point to assist the furnace system to reach the desired end point in the most direct way.

Any system of practical slag control must first provide for removal of phosphorus to a point below the desired maximum. Certain definite limits on the minimum percentages of lime

and iron oxide in the slag, and definite fluidity characteristics are required for phosphorus elimination. "V" ratios of 2.2 to 2.5 offer a safe working range to insure removal of phosphorus. If a "V" ratio of 2.5 is greatly exceeded, the viscosity of the slag is also greatly increased, the action in the furnace is retarded, the heat transfer to the bath is lessened, and the iron oxide content of the slag is increased.

The lime necessary to arrive at a "V" ratio in this range of 2.2 to 2.5 may be derived all from the original charge, or a deficiency of lime may be charged, and additions of burnt lime may be subsequently made. Theoretically, knowing the weights and analyses of the components of the metallic charge it would be possible to calculate the exact quantity of lime which would be required to form the desired slag from such a charge. This procedure would be exactly the same as calculating the "burden" on a blast furnace, which has been practised successfully for many years.

It is impossible to make accurate calculations in actual open hearth practice. A major portion of the charge is steel scrap of a heterogeneous nature, and its exact composition cannot be obtained by analysis but can be only roughly estimated. Under some conditions of operation, such as taking hot metal from several blast furnaces through large mixers, a reasonably accurate estimate may be made of the composition of the hot metal which will be added some hours subsequent to charging the furnace. When hot metal is taken from only one blast furnace, even the best estimate may be far from correct when the time comes to charge the hot metal, due to unexpected "swings" of the blast furnace. No less important is the fact that the



SLAG PANCAKES

Creased slags.
Lime . Ratios of
Silica . 1.2 to 1.6

Furrowed slags.
Lime . Ratios of
Silica . 1.4 to 2.1

Intermediate slags.
Lime . Ratios of
Silica . 2.1 to 2.4

Basic slags are
finishing slags with
Lime . Ratios
Silica . over 2.4

amount of lime actually obtained in the slag may be very appreciably more or less than the quantity charged, because of lime remaining on, or picked up from the bottom.

Since, as shown above, even the most accurate and detailed calculations on the composition of the charge which it is practical to make fail to give reliable figures on which to base the lime charge, the best solution of the problem is to charge either what past practice shows to be the minimum quantity of lime for phosphorus removal, or deliberately to charge a deficiency of lime, and add lime as required during the course of the heat. Since the operator is faced with a choice of charging too much or too little lime, it seems preferable to charge a deficiency because it is a simple matter to add more lime as required, but impossible to remove an excess of lime. As suggested by Earnshaw Cook¹⁴, it is possible to neutralize excess lime by additions of silica or sand; however, such a procedure unnecessarily increases the slag volume, and can be recommended only as a remedial measure in case too much lime is inadvertently present. The procedure of charging a deficiency of lime has been practical only since the development of a rapid and reliable method, such as the "pancake" method, for estimating the basicity of a slag.

Shaping-Up of Slag

In order to take full advantage of the practice of charging a deficiency of lime, it would be desirable to develop by experiment a relationship which would enable the operator, before the heat was melted, to estimate the actual amount of lime which would be brought up. With this knowledge, he would be able to add part of the make-up lime at a period when the slag was highly acid and thus minimize its erosive action on the basic banks, and at the same time get a head-start on shaping up his slag. To the authors' knowledge such a procedure has not yet been developed on a practical basis, but it seems entirely feasible with the aid of visual examination of slag cakes.

The process of "shaping-up" the slag should begin as soon as the greater part of the lime is up, but before the heat is entirely "melted." The use of fluorspar is very beneficial in facilitating the solution of lumps of calcined limestone, and spar is usually necessary to obtain the desired fluidity at this period when the slag is rather

"mushy" and low in iron oxides. Some care and experience in the use of spar is necessary to avoid over-sparring at this time, which might lead to excessive fluidity at a later stage. Changes in the basicity of the slag as the lime is dissolved should be followed by periodic "pancake" tests. Spar imparts an etched appearance to the surface of the slag cakes, which must be considered in the interpretation of the tests.

Corrective additions of burnt lime should be made when it is estimated that solution of the remaining lime will not bring the "V" value of the slag

paring slag conditions existing in various plants, for it translates into numerical values such indefinite terms as "fluid," "creamy," and "viscous." The range of slag fluidity desired during the refining period corresponds to viscosities of 2 to 4 in., as measured by the Herty Viscosimeter.

For the same reasons which make it difficult to calculate the lime charge necessary to give a slag of desired basicity at melt, plus additional complications arising from differences in degree of oxidation with variations in the physical condition of the scrap, it has been found that it is impossible to

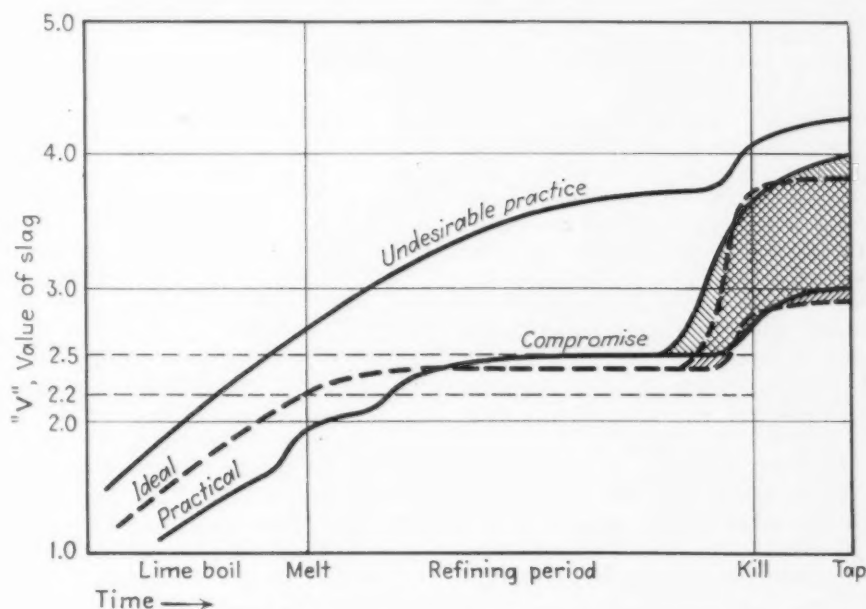


Fig. 7—Schematic comparison of slag control practices.

up to the desired range of 2.2 to 2.5. The amount of burnt lime required to effect a given increase in the "V" ratio will depend primarily upon the slag volume and also upon the slag composition, and additions must be based upon actual experience, but with the usual practice on 125 to 150 ton heats, 1000 lb. of burnt lime in complete solution will increase the "V" ratio by 0.2 to 0.4.

Fig. 7 is a schematic diagram comparing ideal and undesirable slag basicity practices with the compromise which may be obtained in practical operation. The use of "pancake" tests in conjunction with the melters judgment of the fluidity of the slag from its appearance in the furnace has largely eliminated the need for a measure of slag viscosity, such as the Herty Viscosimeter¹, for control purposes. The Herty Viscosimeter was a valuable tool at the time it was introduced, and it is still useful for com-

proportion the scrap and pig iron in the charge in such a way that the carbon content of the bath at melt will be the exact amount required for proper refining of the heat.

Making Oxide Additions

In general, it is more satisfactory in practice to charge a little more carbon than is necessary, rather than too little. The extra carbon which is thus obtained may be removed rapidly by additions of ore. Although mathematical calculations may be made to determine the amount of ore required to reduce the carbon from a given point to a lower value, this information has been known from practical observation by most open hearth operators since long before the theories were invented.

The reactions by which ore removes carbon from the bath have been covered in the theoretical discussion of carbon elimination. As was shown

¹⁴ Earnshaw Cook, "Basic Open Hearth Slag Control," Transactions of the American Society for Metals, V. 25, pp. 325-416 (1937).

there, the effect is to accelerate the rate of carbon drop until the added oxygen has been removed from the bath; but eventually the FeO content of the bath and slag, and the rate of carbon drop, will become the same as would have obtained if the same amount of carbon had been removed more slowly by oxidation by the flame alone. For this reason, the addition of ore is not detrimental to steel of any grade if sufficient time is allowed for the oxygen thus introduced to be worked out of the bath by the carbon boil. A safe rule is to add no ore to high quality forging and alloy heats during the last two hours before tap.

Oxide additions may be made in the form of lump ore, fine ore, or mill scale. Lump ore is preferable in most cases because it penetrates through the slag and much of it reacts directly on the steel bath, thus eliminating the time lag required for solution in the slag and transfer of the added FeO to the steel bath by the usual convection and diffusion process. Mill scale does have some beneficial effect in helping to flux lime floaters before the slag is shaped up. There is frequently some time lag before the effect of such scale additions becomes apparent in the bath, followed by a very sudden drop in carbon after the scale might have been thought to have been dissipated. For this reason, the use of hard ore for removing carbon from the bath and spar for shaping the slag is considered to be a better practice for quality heats. It is recommended that the greater part of the estimated ore requirement, up to a maximum of about 5000 lb., be included in the first addition. One-half to $\frac{3}{4}$ hr. should be allowed to ascertain its effect before further ore is used, the additions being tapered off in such a way that the carbon drop does not get beyond the melter's control.

Mill scale has been recommended at various times for "iron oxide control" of the slag, and it is believed that the practice has been misconstrued to some extent. An effort was made in the theoretical discussion to show that the active iron oxide content of the slag is determined by the carbon content of the bath and the ability of the slag and bath to react normally through the convection process. The total iron con-

tent of the slag is affected also by the basicity because of the formation of stable calcium ferrites. The total iron content of the slag is, and should be considered, a result of the control of slag basicity and viscosity in conjunction with the carbon content of the bath, and it should not be an object of specific control in itself.

The reason for adding mill scale is not to increase the iron oxide content of the slag as an end in itself, but to bring the carbon and oxygen content of the bath to a given point, in working "equilibrium" with the slag, faster than the same point would be reached by oxidation by the flame alone. Because it remains in the slag and does not carry siliceous impurities into the bath, mill scale is permissible at later stages of the heat, where the use of ore would be prohibited.

Furnace Deoxidation

At the end of the refining period of the heat, when the carbon has been lowered to the desired point, and the phosphorus and sulphur are below the desired maximum, the heat is ready for furnace deoxidation. It is desirable to slow up the transfer of oxygen from the slag during the deoxidation period in the furnace, and this can be done by increasing the viscosity, or "thickening up" the slag by addition of burnt lime. In case the furnace deoxidation practice used calls for an interval of 10 to 15 min. between the addition of the deoxidizers and tap, the addition of burnt lime for thickening up the slag may be made just prior to the introduction of the deoxidizers. When the deoxidation practice used calls for a longer interval than 15 min. between start of furnace deoxidation and tap, it is necessary to increase the basicity of the slag somewhat before the final addition of burnt lime. If the basicity is not increased, the solution of the added lime will take place so rapidly that by the end of the longer deoxidation period the slag will have thinned out to such an extent that serious re-oxidation of the bath will take place and thus nullify the effect of the deoxidizers added. If the heat is allowed to "open-up" before it is tapped, the FeO accumulated in the slag during furnace deoxidation may all be trans-

ferred to the bath with disastrous results.

Therefore, when a short deoxidation period is used, the recommended basicity ratio of 2.2 to 2.5 for the refining period may be carried until immediately prior to the furnace deoxidation at which time two to three pans of burnt lime are added. When a long deoxidation period of say 25 or 35 min. is used, additions of burnt lime should be started $\frac{1}{2}$ hr. or more before the furnace block, increasing the basicity of the slag to around 3.0 to 3.5 ratio, dependent upon the time interval used. One to three additional pans of burnt lime may then be charged just before the furnace deoxidizers are added.

In actual practice, so many variations in furnace deoxidation practice exist, due to different grades and types of steel and different combinations of deoxidizers, that only a general recommendation can be made as to the final condition of the slag just prior to furnace deoxidation. Although this final conditioning of the slag must be based upon the deoxidation practice employed, the general principles of slag control during the refining period should be very generally applicable to all grades of killed steel in any shop, since they are aimed at arriving at the furnace deoxidation period with the lowest oxygen content of the bath and slag in the shortest possible time.

The recommended practices for slag control may be very briefly summarized as follows:

- (1) Charge a slight deficiency of lime and make additions of burnt lime as necessary to maintain a basicity range of 2.2 to 2.5 "V" value during the refining period.

- (2) Maintain a fluid slag (viscosity of 2 to 4 in. as measured by the Herty Viscosimeter) within the above basicity range during the refining period by the use of fluorspar.

- (3) Charge heats to melt somewhat above the desired melt carbon, and use hard ore as required to reduce the carbon rapidly. No ore to be added to quality heats during the last 2 hr. before tap.

- (4) Thicken up the slag by additions of burnt lime just prior to charging furnace deoxidizers, in order to decrease the rate of transfer of FeO to the bath.

Process Control of SPOT WELDING

By C. L. HIBERT
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THE important property to be considered by the design engineer is the shear strength per weld, which is the load necessary to shear a single spot between two sheets that are stressed in tension. Table I (see article last week) gives the minimum shear strength requirements for various spot welded materials. These data have been garnered from various sources, and the actual shear strength per weld will average much higher in regular production. The design strength shown in the same table is based on two-thirds of the minimum shear strength—these values may be used until approved design requirements are established. When two or more sheets of unequal thickness are welded the values for the thinnest gage are used.

The common error in designing spot weld parts is the failure to allow sufficient edge distance or spacing welds too close together. The distance from the center of the weld to the edge of the sheet should not in any case be less than four times the thickness of the thinnest gage welded. The width of the flange or overlap of the seam should not be less than eight times the thickness of the thinnest gage welded in the joint. For more than two thicknesses of sheet welded together, both the minimum flange depth and the min-

WHAT the requirements are for successful aircraft spot welding, the welding variables, time of current dwell, diameter and shape of electrodes, pressure, contact resistance and current density were all dealt with last week. Herein, in the second and last section of this report, the author presents data on the design of spot welded parts, equipment necessary, personnel and inspection procedure.

imum edge distance, as given in Table II, should be slightly increased.

TABLE II
Spacing Data for More Than Two Thicknesses of Metal

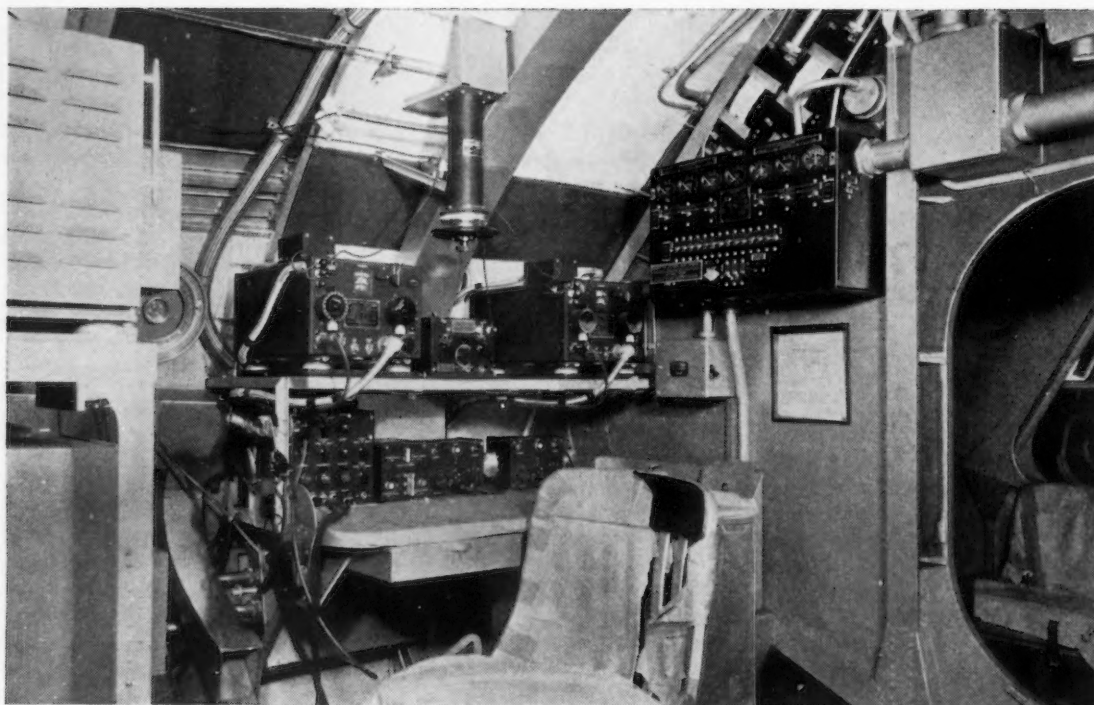
Sheet Thickness	Minimum Edge Distance	Minimum Flange Depth
0.014 in. or less	1/16 in.	1/8 in.
0.030 in. or less	1/8 in.	1/4 in.
0.046 in. or less	3/16 in.	3/8 in.
0.062 in. or less	1/4 in.	1/2 in.
0.078 in. or less	5/16 in.	5/8 in.

The minimum allowable spacing of spot welds is the same as the minimum

flange depth, as given in Table II. Spacing can, in many cases, be approximately the same or slightly less than similar riveted construction. In any event, spacing should not be designated in less than 1/4-in. increments. Spot welds are usually placed in by eye, and therefore only approximate spacing should be called for. For instance, 1/2-in. approximately, 3/4 in. approximately, etc. A typical spacing for 18-8 stainless steel would be 1/2 in. apart, and 1 in. for non-structural parts of aluminum alloys.

Sheets of varying thickness may be spot welded, and several sheets up to four and five may be spot welded simultaneously. Combinations of gages that vary widely may make a job impractical and should be avoided. No hard and fast rules can be given, but a ratio of thin to thick greater than 1 to 3 in aluminum alloy may be considered impractical. Of course, with steels the ratio may be much greater as steel welding is not so critical as for aluminum alloys. Different combinations of thicknesses should be kept to a minimum on any one part, as each combination requires a different setting of current and pressure on the spot welding machine.

Welds in aluminum alloys are notoriously weak in tension and torsion, consequently welds should be applied



INTERIOR view of the radio room of a commercial ship built for American Export Lines. The ventilating ducts, conduit boxes, switch panels and radio table are all spot welded.

so that they are stressed in shear only. Torsion and tension stresses may occur in a design where one weld is isolated in a structure. An example of this would be welding the ends of a corrugated section to an angle with but one weld in each corrugation. In such instances the material is free to work between each weld, causing failures.

Stainless steel may be considered the ideal material for spot welding, as the welds are strong in either shear, tension, or torsion. With sufficient number of welds properly spaced, 100 per cent efficiency of the joint may be realized. Cost per weld has been given by some authorities at as little as 0.1c. Size and design of parts present no limitations for stainless steel, as portable tools and various unique setups can be utilized.

With aluminum alloys it is a different story, for here most of the welds are effected on a fixed machine of high electrical capacity, and many special tricks of the trade cannot be employed. To set any limits on the size and shape of objects that can be accommodated on spot welding equipment is hardly possible as special equipment may be designed to reach relatively inaccessible places. The thought to bear in mind for aluminum alloys is the larger the parts welded the less positive results will be obtained. For this reason and also from a cost standpoint, parts should be small and easily accessible.

A thickness of $\frac{1}{8}$ in. for one sheet

can be welded in aluminum alloys. Total thickness can be greater than $\frac{1}{4}$ in. as long as the stack does not contain a gage heavier than $\frac{1}{8}$ in.

Spot welding of aluminum alloys is limited to the following alloys by the Army and Navy bureaus: 17ST Alclad, 24ST Alclad, 52 S, and 53ST for extruded shapes. Drawings must be submitted for approval of each specific part and up to recently only approval for non-structural parts was granted.

The correct symbol to indicate spot welds on drawings is the dollar sign (\$) with but one cross bar, in order to distinguish spot welds from rivets. It is a good policy in long seams in aluminum alloys to use a rivet at each end and rivets at regular intervals, to prevent tension failures from starting. With steels there is no necessity for doing this except for aid in assembling.

Spot welded parts subject to vibration appear to stand up as well as if they were of riveted construction. Seam and spot welded tanks have passed the requirements of Army and Navy vibration tests. Cowling has been welded and has been in service for over three years without evidence of failure.

Equipment

The equipment required for spot welding consists of machines, electrodes, timing control, heat control, pressure control and auxiliaries. The requirements, of course, are deter-

mined by the nature of the material to be welded. It is essential to have equipment of sufficient electrical power, and in general the best results are obtained when a high current is passed through the work in a short period of time. Nominal or name plate kva. ratings are usually one-half of the maximum output of the machine, and kva. ratings are determined by multiplying secondary volts by secondary amperage. Secondary amperage is assumed to be a product of primary amperes and turn ratio. The amount of secondary volts necessary for spot welding machines is found from the formula.

$$\text{Secondary Volts} = \frac{\sqrt{\text{Area (secondary amperes)}}}{53,000}$$

The area, in this case is the cross-sectional area between the welding arms, consequently the smaller this area the smaller the capacity needed. The larger this area the less efficient is the machine, due to the power losses from impedance. As mentioned previously, kva. ratings are a function of throat dimensions, power factor, and efficiency.

With portable tools the impedance is increased in proportion to the length of leads used. For electrical efficiency it is best to use a cable designed for low impedance, such as a kickless cable.

There should be sufficient increments of current adjustment to insure suitable power control. Electrode pres-

sure should on all equipment be applied by air or hydraulically. For precision welding the spring or hand pressure operated machine is out of the question. The demand for uniformity in modern spot welding is becoming more strongly felt as the process develops, and machines should be purchased on test results and not on price alone. It is also important to keep non-essential components to a minimum, for the less adjustments the operator has to control the more confident he is of results.

The type of time control is important, and the use of poor timers will offset any benefit derived from first class welding machines. Sometimes it is possible to operate two welding machines from one timing control, if the time is set for the same period and the welding transformers can be separately controlled for power supply. Sometimes this can be accomplished with interlocked contactors.

Certain features should be included in the equipment. Operation should be automatic, with a single position foot switch, or a hand switch for portable welders. The sequence of operation should then follow immediately after depressing this switch.

The transformer should incorporate either water or blower fan air cooling and have adequate electrical power. Kva. ratings should not be specified, but instead the ability to weld the maximum gage material that will be used in production should be asked for. The welding arms should have adequate capacity to carry the current without over-heating, and should be designed for maximum rigidity consistent with slenderness to permit their use in crowded quarters.

All controls should be so situated as to be in easy reach of the operator, and duplicated for portable equipment. Tools and electrodes should be standard and interchangeable with all pieces of equipment. All these factors will improve adaptability and minimize set-up time.

Weld recorders that measure the I^2t part of the formula $H = I^2Rt$ are worth while additions to the spot weld machine. These are usually ballistic galvanometers and measure the input of current on the primary side of the welding transformer, and show serious current and time fluctuations. Other types record the voltage drop of the welding arms using this circuit as a shunt. None will definitely show a difference in welds due to other factors than time or current. So far no recorder has been produced that will definitely say one weld is good and

another weld is bad. Nevertheless, the weld recorder has a certain psychological effect on the spot weld operator, and its use eliminates two variables that would be unknown otherwise.

Personnel

Suitable personnel is the criterion of whether the spot welding department functions with any degree of certainty. Of all factors mentioned so far, the elusive human element is the most difficult to control. Men are not machines and their actions vary from time to time. Neither is it possible to have them all react the same on each job. Some men click without previous experience while others never do make satisfactory welders and have to be shifted.

Tip condition is particularly important, and a new man must be shown the necessity of maintaining tips with-

in certain limits. Tips must be lined up with care, cleaned after evidence of pickup, and removed for redressing after they are badly worn. Work must be held at a right-angle to the electrodes for best results and there are other criteria necessary to produce quality welds that can only be achieved by experience. It takes some experience to place welds in the proper place by eye, without the use of jigs and fixtures. Welds must not be placed too close to the edge, or too near the radii for good fusion.

Frequent test samples must be made during production as a check on electrode condition and the character of the welds. A weld that will pull a slug approximately four times the sheet thickness when rolled apart should be satisfactory. As exterior appearance of a spot weld means nothing, except in the case of bad splashing or evidence of overheating, a visual method

TYPICAL RECORD FORM

Part No. _____ Page _____

AIRCRAFT COMPANY

RESISTANCE WELDING

Name _____

Current Setting _____ W.O. _____

Pressure, Lbs. _____ Model _____

Time in cycles _____ Material _____

Spacing _____ Thickness _____

Switches _____ No. Welds _____

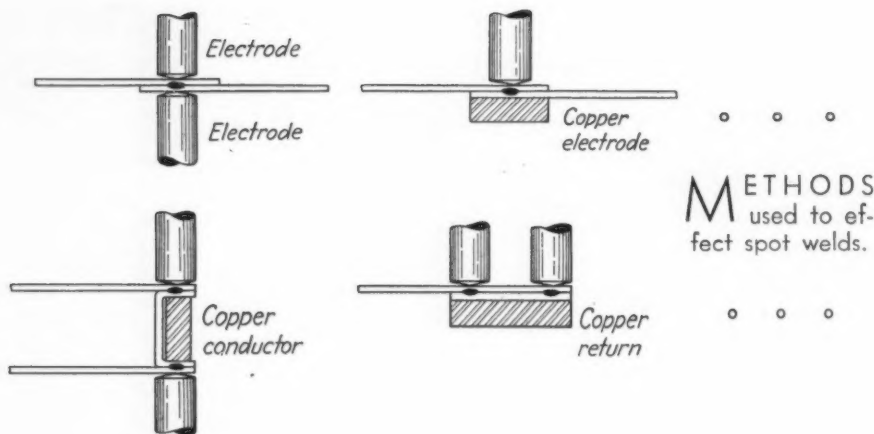
Machine _____

Remarks: _____

Test Results		Amount completed							
No.	Lbs.	No.	Date	No.	Date	No.	Date	No.	Date
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
Ave.									

Welded by _____ Checked by _____ Qty. Req'd. _____

Note: Make test samples before spot welding job.



of inspection is out of the question. Therefore all responsibility falls on the operator to produce good strength welds.

It is a good policy that the operator have no other duties but that of operating the welding machines. Nothing slows up production as to have the operators stop and clean work or attempt to supervise the helpers. A leadman should be provided to handle helpers and welders. It is also essential that sufficient help is provided to keep a constant flow of parts to the welding machine. It is not very often that it is necessary for a man to hold parts for the operator while he is welding and frequently one man can line up work and do a faster job if a means of mechanical support for the work is provided.

Supervision

The Bureau of Aeronautics requires that contractors desiring to use spot welding shall submit information on the qualification of the supervisory personnel responsible for the work and the steps that will be taken to periodically check the quality of the welds being produced. The supervisor is responsible for the quality of the work and it is his job to see that production flows smoothly with the least changes in setups. A record should be kept of each job showing the welding settings, time on each part, number of welds, and other essentials. The value of spot welding is primarily the difference in cost from similar riveted construction or other forms of welding. If this differential cannot be maintained there is no need of a spot welding department. A weld counter installed on the control panel is a great aid in checking production and to ascertain labor cost.

It is also the duty of the supervisor to sketch electrode tools that are needed to handle future jobs, and to care for engineering changes to sim-

plify production. In this respect he should act as liaison between engineering and planning departments and the shop. Also he should see that frequent test samples are made as a check on the quality of the welds.

It is important that the supervisor realize the necessity of keeping every possible variable under strict control no matter whether it be sheet condition, current, time or pressure, or that more elusive factor the human element. The better control over all of these, the less will be the grief experienced.

Inspection

The inspection of the work can be carried out either by the supervisor or the company inspector. As it is almost impossible to determine a good weld from appearance only, it is the inspector's duty to see that satisfactory results are indicated by the test samples. These usually consist of the same thicknesses of material as the job, spot welded with a series of welds and torn apart by a tension stress of the welds. This can be done by clamping one piece in a vise and rolling the other sheet with a pair of pliers much as a sardine can would be opened. Small splashes that occur between the sheets adjacent to the weld are no indication

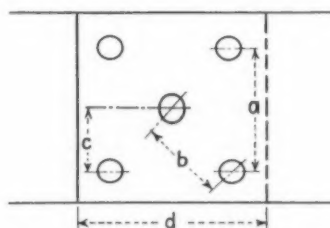
of poor welds, although these may be avoided by using a flatter electrode. The slug should be approximately four times the thickness of the thinnest gage in the sample. Of course with the heavier gages it is impossible to maintain this ratio.

Evidence of exterior splashes or pinholes indicates poor welding technique. Excessive pickup of copper electrode material on the sheet is to be avoided as this destroys the corrosion resistant properties of some materials. Over-heated welds have the same effect. Too much emphasis should not be placed on exterior appearance, as some beautiful looking welds may be of poor quality.

Steps should be taken to insure that the material to be welded has been properly cleaned prior to assembly, and that the job is properly assembled. For, once a job is welded it is rather difficult to tear apart. If it is necessary to shear a few welds this can be accomplished by cutting them with a thin hack saw that has been sharpened like a chisel on one end. The blade is inserted between the sheets welded and the spot weld sheared by gently hammering the other end of the blade. Care must be taken to avoid tearing a slug from one of the sheets.

Joints to be spot welded should fit together rather tightly instead of forcing them together with the pressure of the electrodes, as the latter procedure will cause buckles and inferior welds. For best results, electrodes must not bear on their outer edges but should only contact the sheet at the welding tip. Test samples are made under ideal conditions, and unless these conditions are maintained on production the welds will be inferior to those found by the test specimens.

To eliminate buck passing, it is advisable to supply each operator with a rubber stamp to identify his individual work.



MINIMUM spacing for maximum joint efficiency. Note: for this type of joint a fixture for spacing spot welds is necessary; spacing on drawings can be given by number, as in the first column.

No.	a, in.	a, in.	b, in.	c, in.	d, in.	d, in.	b ÷ 8	Sheet Thickness
2	3/16	0.187	0.132	3/32	3/8	0.375	0.016	0.005 - 0.015
3	1/4	0.250	0.177	1/8	1/2	0.500	0.022	0.016 - 0.020
4	5/16	0.312	0.220	5/32	5/8	0.625	0.027	0.021 - 0.025
5	3/8	0.375	0.265	3/16	3/4	0.750	0.033	0.026 - 0.030
6	7/16	0.437	0.309	7/32	7/8	0.875	0.039	0.031 - 0.035
7	1/2	0.500	0.353	1/4	1	1.000	0.044	0.036 - 0.040

Heat Resisting STEELS

WHAT is the history of the development of heat resisting steels? What are some of the types of steels now available and their service characteristics? Such questions are answered in these notes of a recent lecture before the Midland (British) Metallurgical Societies.

BY
W. H. HATFIELD

IN remarks preliminary to the lecture on heat resisting steels, Dr. Hatfield stated that he had accepted the invitation with great pleasure and interest, because, although obviously when a great war is being fought it is not practicable to continue as in time of peace, yet he thought everyone must admit that technical progress came next in importance to the maintenance of forces in the field.

Had it not been for two British chemists, Thomas and Gilchrist, Germany today might approximate more nearly her former pastoral condition. For it was due to these two men that the basic ores of Germany were released, so making possible a great misuse of the powers of metallurgy. Certainly, those interested in large industrial enterprises are now very busy and plants are working at full blast, but it must be appreciated that the development of scientific knowledge must not be given up during the war.

With regard to heat resisting steels, Dr. Hatfield first surveyed what happens to mild steel over a wide range of temperatures, say from -292 to 1830 deg. F. Of course, it should be borne in mind that different results

would be obtained on carbon steels of other compositions. Perhaps the outstanding feature as regards mild steel, taking for example a 0.25 per cent carbon steel, is the fact that the maximum stress is increased whether the temperature be raised or lowered from normal room temperatures. What was known as the "blue brittle" zone occurred in such a steel at about 390 deg. F. This phenomenon of the hardening of mild steel when heated to such a temperature was originally well known to investigators but it was not so widely appreciated by the general industrial world. On heating the steel above this point, the maximum strength begins to fall. At 1290 deg. F., it is only about $13,000$ lb. per sq in. and the decrease in strength continues as the temperature approaches that at which the steel was hot worked. It also may be observed that at very low temperatures, below room temperature, the maximum strength rises.

In dealing with heat resistant steels, they had first to be considered in the light of their strength at elevated temperatures. This may be viewed either as resistance to stress at certain temperatures with a certain favorable

amount of deformation, or alternately from the standpoint of the deformation produced by a certain stress at a given temperature. Secondly, there was the question of resistance to scaling, and clearly a steel which may have a sufficient margin of strength at a certain temperature was not of industrial importance if it was subject to severe scaling at that temperature. Ordinary tensile tests of steel at normal temperatures gave the maximum stress, elasticity and ductility values of the material, and the designer knowing these properties could work with a reasonable success.

Some years ago, stated Dr. Hatfield, he had had occasion to introduce the austenitic nickel stainless steels into Great Britain, and it had been suggested that these steels, which after cold-working had a very high mechanical stress, would deteriorate under comparatively low stresses even at normal temperatures, given sufficient time. It had been suggested that any steel would flow and permanently deform under any stress and that the movement could be observed provided the sensitivity of the measurement were sufficiently refined.

TABLE I
Scaling and Creep of Steels With Increasing Chromium Content

Steel	Analyses of Steels With Increasing Chromium Content						Scaling Index—Gain in Weight in Mg. Per Square Centimetre for Seven Cycles of Heating and Cooling						Time Yield, Lb. Per Sq. In. (One Millionth Inch Per Inch Per Hour)				
	C	Si	Mn	Ni	Cr	N ₂	600 Deg. C.	700 Deg. C.	800 Deg. C.	900 Deg. C.	1000 Deg. C.	1100 Deg. C.	400 Deg. C.	500 Deg. C.	600 Deg. C.	700 Deg. C.	800 Deg. C.
Mild	0.24	0.21	0.54	0.15	Nil	...	4.4	34	84	...	...	...	...	8,960	2,240	400	...
A	0.23	0.28	0.73	0.63	2.16	0.003	...	22	...	...	...	...	...	6,720	1,250	350	...
B	0.23	0.30	0.44	0.53	5.38	0.009	...	18.5	...	...	...	...	...	6,720	2,240	340	...
C	0.24	0.39	0.47	0.49	8.51	0.008	...	9.8	...	...	...	...	...	8,960	1,000	300	...
D	0.26	0.38	0.40	0.51	11.46	0.009	...	...	...	...	...	...	...	4,480	1,100	330	150
E	0.24	0.20	0.41	0.02	15.04	0.014	...	...	0.3	32	...	...	32,480	12,880	1,350	240	125
F	0.26	0.34	0.55	...	21.89	0.012	...	...	...	0.5	...	38	26,880	10,080	1,650	350	350
G	0.20	0.58	0.43	...	33.52	0.013	...	...	...	0.4	2.3	5.7	38,080	29,120	2,240	350	350

Consequently, an experiment was carried out. If a 10-ft. length of steel was considered under stress for 20 years and if, after that period, it had not extended its length more than 0.001 in., it could be regarded that, for all practical purposes, the steel had permanence of dimension. Nearly 11 years ago, a strip of cold-worked

austenitic chromium-nickel steel was put under a stress of 56,000 lb. per sq. in. Since that time it had been under constant observation, and measurements of the test piece had been carefully made month after month. Dr. Hatfield definitely stated that if any creep whatever had taken place in that time, it was of such order that if

a 10-ft. length were placed under a load of 56,000 lb. for 20 years, the actual increase in the total length of the specimen would be less than 0.001 in. This experiment showed for all practical purposes the permanence of dimension under ordinary loads of such steels.

When a red heat was reached, such a degree of permanence of dimension under stress does not hold. An alloy steel at such a temperature under ordinary tensile test may give a maximum stress of 45,000 lb. per sq. in., but if it is stressed under a load of as little as 2240 lb. plastic deformation occurs and may definitely continue for a long period of time at that temperature. It has been necessary, therefore, to study the phenomenon of resistance to stress with time, and the value was termed "creep resistance."

How has it been possible to convert mild steel with little strength at high temperatures to steel with great strength at high temperatures? This was a very big subject, and one on which an immense amount of literature has been published and large numbers of patents taken out. If all these data were tabulated, it would be found

TABLE II
Scaling and Creep of Various Heat Resisting Alloys

	Compositions of Various Heat Resisting Steels									Scaling Index (Gain in Weight in Mgms. Per Square Centimeter)								Time Yield, Lb. Per Square Inch (One Millionth Inch Per Inch Per Hour)								Maximum Temperature at Which Steel Can Operate, Deg. C
No.	C	Si	Mn	Ni	Cr	W	Mo	Ti	Condition of Test Specimen	800 deg. C	850 deg. C	900 deg. C	950 deg. C	1000 deg. C	1050 deg. C	1100 deg. C	1150 deg. C	1200 deg. C	400 deg. C	500 deg. C	600 deg. C	700 deg. C	800 deg. C	900 deg. C	1000 deg. C	
1	0.24	0.21	0.54	0.15	Trace	...	...	...	Normalized, 870 deg. C. Annealed, 650 deg. C. O.H. 970 deg. C T. 750 deg. C O.H. 950 deg. C T. 750 deg. C	84	...	250	...	...	...	...	...	...	...	17,920	8,960	2,240	400	...	...	...
2	0.28	0.22	0.53	0.16	0.11	...	0.66	...		of the same order as ordinary mild steel.	30,240	17,920	2,240	450	...	...	...	...	...	30,240	17,920	2,240	450	...	...	...
3	0.29	0.30	0.28	0.35	13.04		0.28	21	32	82	250	32,480	12,880	1,350	240	125	...	...	700 to 750
4	0.40	3.88	0.53	0.16	8.19	...	...	...	O.H. 950 deg. C	...	...	0.33	...	0.64	38	76	500	...	42,560	8,960	2,240	300	180	...	...	900
5	0.14	0.64	0.32	8.0	17.36	0.68	...	0.56	A.C. 1050 deg. C	0.12	2.6	6.7	75	175	...	750	...	...	27,440	24,600	11,200	4,480	1,000	200	70	800
6	0.49	0.74	0.51	14.15	12.93	3.0	...	...	A.C. 950 deg. C	1.8	12	23	40	110	...	...	...	...	17,920	17,920	7,840	3,360	800	190	70	950 to 1000
7	0.23	1.65	0.41	11.85	23.20	2.98	...	...	A.C. 1050 deg. C	...	...	0.41	...	2.0	...	15	36	1000	42,560	26,880	10,080	3,920	1,200	280	90	1050 to 1100
8	0.35	1.69	0.65	7.22	19.10	3.96	...	...	A.C. 1050 deg. C	...	...	0.31	...	2.8	...	30	54	...	56,000	22,400	7,840	3,920	1,200	280	90	1050 to 1100
9	0.41	1.48	1.33	27.69	15.70	4.07	...	...	A.C. 1050 deg. C	...	...	0.61	...	0.73	...	6.4	...	37	42,560	20,160	5,600	3,360	900	260	90	1050 to 1100
10	0.12	1.50	0.33	21.07	24.63	...	...	...	A.C. 1050 deg. C	...	...	0.22	...	5.1	...	11	...	31	29,120	23,520	8,400	3,360	900	260	70	1100 to 1150
11	0.20	0.58	0.43	...	33.52	...	...	...	A.C. 1000 deg. C T. 700 deg. C A.C. 1050 deg. C	...	...	0.41	...	2.3	...	5.7	...	19	38,080	25,760	2,240	320	350	260	70	1100 to 1150
12	0.07	0.44	1.42	63.20	12.52		A.C. 1050 deg. C	1.6	...	4.0	...	30	...	44	...	33,600	8,400	3,360	1,500	260	100	1100 to 1150
13	0.07	0.27	0.21	78.55	13.44	...	...	...	A.C. 1050 deg. C	...	...	...	...	...	...	...	...	2	...	22,400	8,960	3,920	1,000	300	...	1100 to 1150
14	0.09	0.65	1.24	77.65	18.72	...	...	...	A.C. 1050 deg. C	...	...	...	...	...	...	...	...	3	...	20,160	10,080	3,360	1,120	...	...	1100 to 1150

that numerous people had suggested that the solution to the problem was to add certain elements in varying proportions. Now, each patent was suggested in order to initiate the public into doing something which it had never done before, but it would be appreciated that if all the elements suggested in the patent literature were taken, and each one only varied three times, about 50,000,000 alloys would have to be made. The life of a nation was not long enough to do this, but as a result of more restricted experimental working, from a practical point of view, a very satisfactory technology has resulted in the production of steels with excellent heat resisting properties.

It was of course impossible to go through all the work that had been carried out. There was, for instance, a series of steels with a constant carbon content, but with the chromium content varying from nil to 33 per cent. These steels are shown in Table I, and as regards resistance to scaling, it will be seen from the data given in the table that as the chromium increases, so does the resistance, and in fact a steel containing 30 per cent chromium shows great resistance to scaling at very high temperatures. Curiously, if the chromium content be increased, the actual strength at 700 deg. C. (1292 deg. F.) was not increased, as is also shown in the table.

The time yield rate was equivalent to one millionth of an inch per inch per hour. These data are useful for certain purposes, but other alloys will stand 10 times the yield stress of the chromium steels without producing a greater rate of creep.

Table II shows a series of heat resisting alloys, all of which are used in the industrial world. The steel containing 13 per cent chromium resists oxidation, but such a steel is not strong at high temperatures. As will be seen from the data given, the steel containing about 23 per cent chromium, 12 per cent nickel and 3 per cent tungsten possesses great strength at high temperatures as well as resistance to scaling, but it was obvious, explained Dr. Hatfield, that a composition which gave the highest resistance to scaling did not necessarily possess the highest strength at any specified temperature. Consequently, various kinds of compromise are made.

In supplying steels to work at high temperatures, the metallurgist does not expect them to last for, say, 20 years. If they last from six months up to two years, they should be regarded as a good proposition, and such are the experimental abilities at the present time that details can be given as to what will happen under such industrial conditions. The metallurgist, however, can not insure that the structure of the steel will be constant all

that time. The resistance to deformation can be determined, but it is impossible to prevent changes taking place in the structure of the metal.

For some years furnaces have been installed for long-time experiments at high temperatures on the structure of steel. Each test piece is substantial in size thereby permitting a very complete study of the material to be made. The furnaces are maintained at temperatures of say 400 deg. C., 500 deg. C., etc., and samples of a particular steel are taken out after periods of one month, six months or a year. From this investigation, much valuable data has already been derived.

As a result of technology, steels are now available which will resist stress with little deformation at high temperatures, and which will at the same time successfully resist scaling. It should be noted from Table II that certain alloys can be used up to 700 deg. C., some up to 1000 deg. C., and others up to 1100 deg. C. The temperature at which the material is to be used would determine the type of heat resisting steel to employ. Obviously, if the temperatures in question did not exceed 700 deg. C., it is useless to pay for a very rich alloy. It is, therefore, very important that the customer should state the conditions of service when applying for a steel for any specified heat resisting purpose.

Desulphurization of Pig Iron

RESULTS of additional investigation of slag-metal reactions, important in the smelting of iron ores, has been reported by the Bureau of Mines. Additional data are available on desulphurization of pig iron with calcium carbide. This process is unique, since, instead of the usual liquid-liquid reaction by which final desulphurization is accomplished in the blast furnace, the process depends on the reaction between solid calcium carbide and liquid iron. Adequate dispersion of the carbide is essential for its efficient utilization.

The major accomplishment of the current investigation was the development of a mechanical dispersing unit for adding finely ground calcium carbide to large quantities of molten cast iron. Through successful operation of this unit, the process has advanced from laboratory to pilot-plant stage.

In cooperation with the St. Paul Foundry Co., St. Paul, Minn., 1-ton

quantities of molten iron were desulphurized, and the metal was then used by the foundry in the production of gray iron castings. The object of the investigation was primarily to determine how completely the sulphur could be eliminated by this method of treatment. Results of these tests proved that the sulphur content of foundry iron can be reduced from about 0.09 to 0.01 per cent by the addition of 15 lb. or less of calcium carbide per ton of metal.

The amount of sulphur eliminated per unit of calcium carbide depends in part on the size of the carbide particles. Calcium carbide coarser than 48 mesh is not as efficient a desulphurizer as the finer material. On the other hand, minus 200-mesh carbide is less efficient than the intermediate sizes.

An important difference between desulphurization with the alkalis and

with calcium carbide is the amount of sulphur that returns to the metal when the desulphurized metal is allowed to stand without being skimmed. The alkali slag must be separated from the metal at the correct time if maximum sulphur extraction is to be obtained. Calcium sulphide, which is formed when iron containing sulphur is treated with calcium carbide, appears stable under the conditions of this treatment.

Other desulphurizers which have been investigated included calcium-lead and magnesium-lead alloys, magnesium metal, calcium boride, and a mixture of finely ground calcium carbide and silicon. In view of the high cost and low efficiency of the metallic desulphurizers compared to calcium carbide, the tests were not continued beyond the preliminary tests. Calcium boride and the carbide-silicon mixtures were too inactive at 1400 deg. C. for use as rapid desulphurizers.

WHAT'S NEW IN CUTTERST

CARBIDE tipped, inserted tooth milling cutters have been introduced specifically for cutting steel at high speed, and the same company has also introduced a steel cutting shaper tool tipped with Kennametal. Other developments relate to mounted grinding wheels of

small diameter, drills, disk grinders, centerless grinder support blades, steel stamps of various kinds, measuring instruments, portable power tools, machine vises, oil hydraulic pumps, lubrication devices and a number of miscellaneous items.

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A NEW series of milling cutters equipped with Kennametal tipped blades have been developed by McKenna Metals Co., 144 Lloyd Avenue, Latrobe, Pa., in cooperation with the McCrosky Tool Corp., Meadville, Pa. Fast machining speeds and high resistance to wear are characteristic of this hard carbide material, which can be used for cutting steel.

The new series comprises nine standard sizes in each of the following types of cutters: Medium duty face mills, heavy duty face mills and shell end mills. Incorporated in these milling cutters are McCrosky features

which are particularly advantageous when using blades tipped with Kennametal. The Jack-Lock wedge is said to lock the blade with extreme rigidity and may be locked and unlocked without pounding, thus avoiding damage to the blades. In addition, the special adjusting screw in back of each blade permits fine forward adjustment which holds to a minimum the amount of expensive carbide material which must be removed to align all blades when regrinding. Blades may be moved forward as little as 0.002 in.

Carbide Tipped Shaper Tool for Steel

ANOTHER recent development of the McKenna Metals Co. is standard steel cutting shaper tools tip-

ped with Kennametal grade KS, for use on shapers and planers to machine steel of hardness up to 550 Brinell. A feature of these new tools is the unusual tool angles employed, namely: 10 deg. negative back rake, 5 deg. negative side rake, 15 deg. side cutting edge angle and 2 deg. clearances. These tool angles are made possible by the low frictional resistance between Kennametal and the work being cut. As a result, less frictional heat is developed than when high speed steel tools with conventional high side rake angles are used. With these tool angles it is unnecessary to lift the tool on the return stroke.

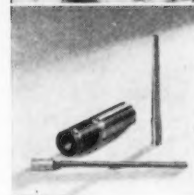
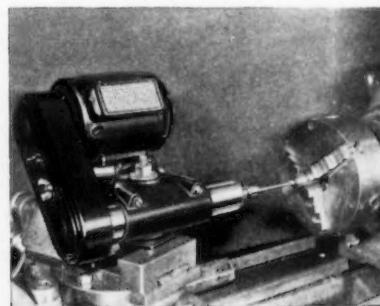
Kennametal shaper tools will shape steel of hardnesses above the machinable limit for high speed steel tools at speeds that are often double those used with high speed steel tools on work in the lower hardness ranges. Die blocks of 42 Rockwell C hardness may be hardened before machining with Kennametal, saving the grinding



STANDARD 7-in. McCrosky Jack-Lock shell end mill tipped with Kennametal grade KM carbide material is shown milling an SAE 4150 steel forging heat treated to a hardness ranging from 28 to 32 Rockwell C. The cutter is run at 92 r.p.m., or approximately five times the permissible speed using high speed steel cutters. Feed is $3\frac{5}{8}$ in. per min. and depth of cut 0.125 in. An average of 160 faces were milled before regrinding the cutter.

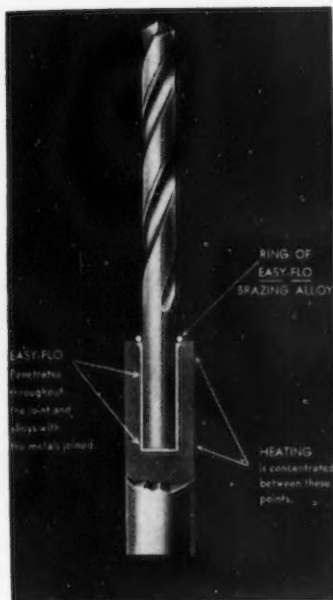


THE new Beaver 71 series tool threads pipe from $\frac{1}{8}$ to $\frac{3}{4}$ in., right or left hand, and bolts from $\frac{1}{4}$ to 1 in., right or left hand, coarse or fine. More than 100 kinds and sizes of dies are available for this tool, which is furnished in a ratchet or a non-ratchet model, as shown. The die bosses project well above the face of the tool body so that chips clear readily. The dies are easily oiled and can be changed in less than a minute. Dies are adjustable for oversize or undersize threads as a unit. This tool can be used with either hand or power operation. It is made by Beaver Pipe Tools, Inc., Warren, Ohio.



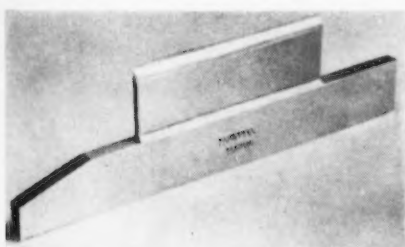
A MOUNTED-WHEEL shank support for internal grinding with small diameter wheels to considerable depths has been developed by the Dumore Co., Racine, Wis. A special 3 in. wheel shank is necessary for use with the support which slips over the tapered shank and minimizes "whipping" of the shank under pressure of the wheel on the work. The support sufficiently strengthens the shank to permit grinding holes over $2\frac{1}{2}$ in. deep. The shank is $2\frac{11}{16}$ in. long and 0.2204 in. in diameter at its larger end.

STOOLS AND ACCESSORIES



LOW temperature silver brazing has been used successfully for putting oversize shanks on standard drills. Shanks were turned from cold rolled steel and were drilled 0.002 to 0.003 in. oversize to give clearance for the brazing material. After the holes were cleaned and fluxed and the drills inserted, a ring of silver brazing alloy was then placed around the drill. The shank was heated by a torch to a dull cherry red and as soon as the alloy had flowed (1175 deg. F.), the joint was immediately cooled to prevent tempering the drill itself. The Easy-Flo brazing alloy is made by Handy & Harman, New York.

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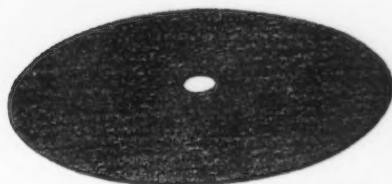


CENTERLESS grinder blades faced with a tough, slow wearing alloy known as Tantung are now being furnished by the Fansteel Metallurgical Corp., North Chicago, Ill. Tantung is composed of hard particles of tantalum and tungsten carbide embedded in a tough matrix. The tantalum carbide not only contributes to the hardness, but also imparts a peculiar lubricating property which improves resistance to wear. The facing is attached to the steel supports by a special brazing process. Complete blades are made to individual specifications, or the brazing may be done by the user.



WHAT is believed to be one of the longest single piece hardened and ground broaches ever produced was recently delivered by Colonial Broach Co., Detroit, to a producer of tractors. Designed for complete finishing of splines in a single pass of the broach in tractor drive bevel gears, the broach itself is over 80 in. long and approximately 5 in. in diameter. The broach is to be used on a machine having a 6 ft. working stroke.

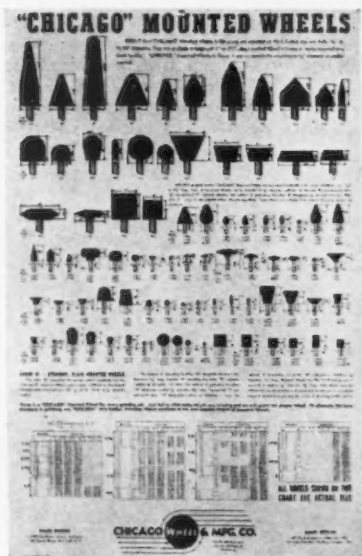
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ABILITY to stand up under high temperature generated in grinding is claimed for the new Silver-Streak insulated grinding disk made by Abrasive Products, Inc., South Braintree, Mass. The new binder used is said to hold the grit firmly at temperatures up to 1800 deg. F. without softening. The abrasive used is a special aluminum oxide grit said to have better than average life, free cutting action and freedom from filling and glazing.



COMBINATION grinder shield and light with molded plastic frame and cadmium plated bracket, recently introduced by the Boyer-Campbell Co., Detroit. The light, supplied by two lamps of the bayonet type, is focused directly on the work. The window is of non-shatterable glass. Magnifying lenses of any focal length are also available for close limit work. All electrical parts are housed in a completely insulated chamber.

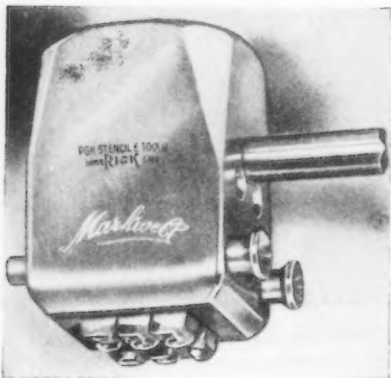


MOUNTED grinding wheels of various shapes and sizes are shown to full scale on this new chart prepared by the Chicago Wheel & Mfg. Co., 1101 W. Monroe Street, Chicago. Group A wheels are mounted on 1/4 or 15/64 in. diameter mandrels, while the group B wheels, as small as 3/32 in. in diameter, shown on the lower half of the chart, are mounted on 3/32 or 1/8 in. mandrels. Dimensions on straight, plain mounted wheels are given in tables.

operation that otherwise would be necessary.

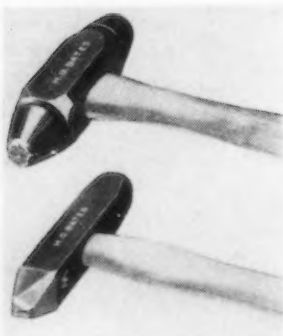
Kennametal KS has a hardness of 76 Rockwell C and an exceptionally high strength of 322,000 lb. per sq. in. This combination of properties has made it practical to employ Kennametal-tipped tools for shaping and planing steel with results equal to those obtained when turning and boring steel with Kennametal. The sizes of tools furnished will fit standard clapper boxes of shapers and planers.

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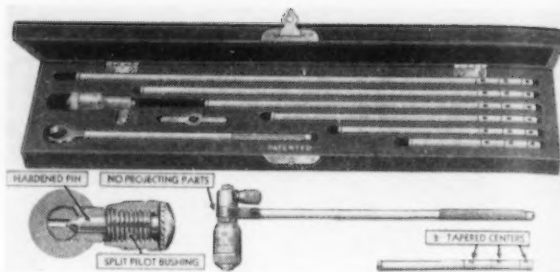
THIS new tandem axe type holder, with three pieces of type in each line, is intended for stamping intensely hot metals. When swung like an axe, this Rick Markwell holder is much more likely to imprint all six numbers than if the six numbers were in line. The only moving part is a lock pin for each row of type. Markwell holders come in all sizes from 1/16 type up to 1 in. or larger. Type is made of Safaloy, a special alloy said to be practically unbreakable. This stamp is made by the Pittsburgh Stencil & Tool Co., 717 Crafts Building, Pittsburgh.

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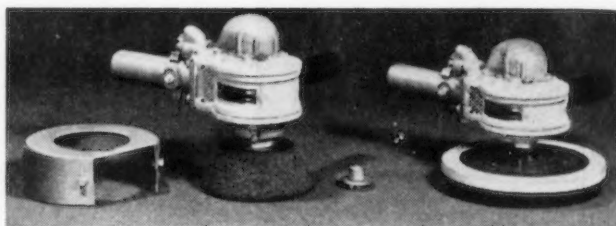
TWO new types of inspector's hammers are being offered by H. O. Bates, 251 N. Broad Street, Elizabeth, N. J. The style B hammer is furnished with one or more symbols engraved on one or both ends. If one end is left plain, it may be used to receive a blow from another hammer or it can be used as a tapping hammer. Style C carries only one letter. Both tools are made of alloy tool steel hardened and tempered.

OUTSTANDING feature of the International inside micrometer is its quick setting, due to the method used in locating the measuring rods. Each rod is marked with its length and held to the head by means of a locating screw which engages a center on the rod. This hardened locating screw is locked in position by the split pilot bushing shown in the sectional view. All rods have three such centers spaced accurately 1/2 in. apart, giving a 1 1/2 in. range to each rod. Micrometer head has a 1/2 in. movement to the screw. These sets are supplied in a range of 1 1/2 to 6 in. or 1/2 to 12 in., by the Pacific Specialty Supply Co., 344 N. Vermont Avenue, Los Angeles.



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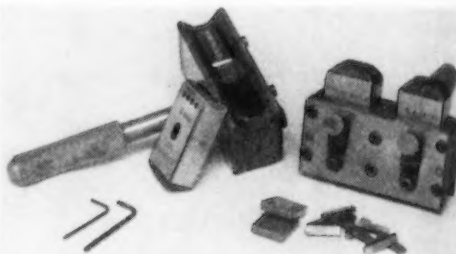
THE Rotor Tool Co., Cleveland, has announced two new vertical types of air grinders, the B-1-X, right, and the B-3-X, left. Both models are used with 6 x 4 x 5/8 in. cup wheels, 6 in. wire brushes, or with a 9 in. sanding pad. The power for both models has been increased over 40 per



cent compared with preceding types, and the maximum power is developed with less than 10 per cent drop in the free speed. A new type of balanced multiport governor controls the maximum speed by compressed spring action which is not affected by variations in air pressure. The two bladed motors are easily maintained. The maker states that this vertical type of tool is much better suited for finishing flat and irregular surfaces than the horizontal type it was built to replace. Increase in metal removal by 33 to 50 per cent is claimed over the preceding models.

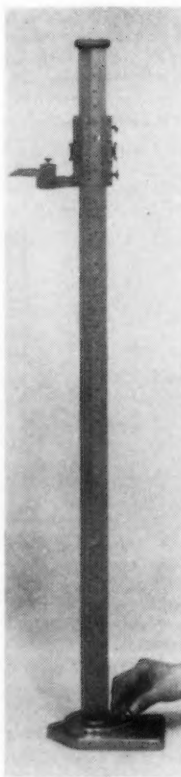
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SHAFTS and rods can be marked with this new form of type holder made by New Method Steel Stamps, Inc., 143 Jos. Campau Street, Detroit. The bottom of the holder is in the shape of a wide V, providing a support on both sides so as to positively align the type and insure clear marking. The type retainer floats in the guide, but its travel is limited by a pin in the guide extending into an elongated hole in the type retainer. A hardened and ground anvil is provided in the type retainers to prevent type from sinking. The same firm is also offering a holder to simplify marking the annual flat faces of gears, bushings, bearing races and the like.



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THREE separate adjustments are available in the new 40-in. model of the Chesterman height gage; namely, a quick locking device, a fine knurled knob at the head and a superfine adjustment at the base. Beam is triangular in section for strength and rigidity. The tool is graduated in both English and metric scales to read to 0.001 and 0.02 mm. and comes with a vernier about 2 1/2 in. long enabling measurements to be read without the aid of magnifiers. This gage is distributed in the United States by the George Scherr Co., 128 Lafayette Street, New York.





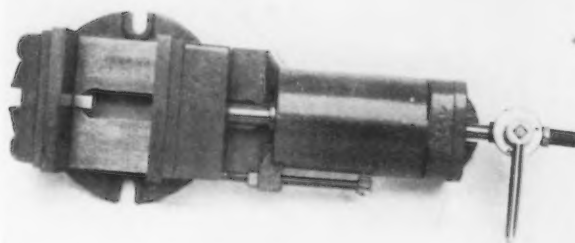
LIGHT weight bevel safety stamps made by M. E. Cunningham Co., 115 E. Carson Street, Pittsburgh. The use of a new alloy steel is said to produce the same strength of ordinary heavy bevel stamps with 35 per cent less weight, making the stamps much easier to handle, particularly in marking finished surfaces. Freedom from mushrooming and spalling is claimed as a safety feature.



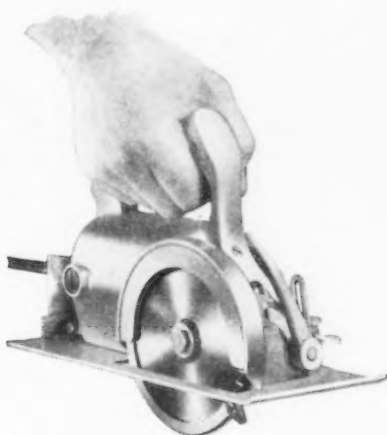
DURABILITY and legibility of markings are featured in the new line of Chrome Face steel measuring tapes just introduced by the Lufkin Rule Co., Saginaw, Mich. Jet black markings are used on a satin chrome-white surface, built up by chromium plating. The surface is said to be smooth and hard and will not chip or peel. These tapes are offered in two brands: Anchor in $\frac{3}{8}$ and $\frac{1}{2}$ in. width, in leather case; and Leader, popular priced model, $\frac{3}{8}$ in. wide, in imitation leather case.



A SLING-SHOT drive, in which the piston is driven back and forth 1600 times per min. by means of a shock-proof rubber connection, is the unique feature of the Thor-Nado electric hammer, just introduced by the Independent Pneumatic Tool Co., 600 W. Jackson Boulevard, Chicago. The rubber connector acts both as a power accumulator and a shock absorber. The blow of the piston is not felt by the operator nor is it transmitted to the helical gear train or the universal type motor. The tool weighs 14 lb. and is $13\frac{1}{2}$ in. long. Capacity, 1 in., star drill in concrete.



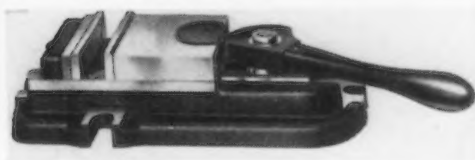
THE Larkin air vise is designed for production work on various types of machines or at the bench. It is available in five sizes ranging from 4 to 8 in. in jaw width, and is regularly supplied with hardened and ground jaws, flanged base and hand operated air control valve. Castings are semi-steel and machined parts are accurately made. The pneumatic feature is responsible for speedy operation of the vise, which is made by the Larkin Air Vise Co., Portland, Conn.



EQUIPPED with a saw blade $4\frac{1}{2}$ in. in diameter, the Guildcutter will cut material up to $1\frac{1}{4}$ in. thick. For cutting any depth less than this, the base lowers and it can be tilted 45 deg. for beveling. A telescopic guard protects the blade at any angle. Frame is cast aluminum. Power is supplied by a universal 110-volt motor. Weight 7 lb. Made by Syracuse GuildTool Co., Syracuse, N. Y.



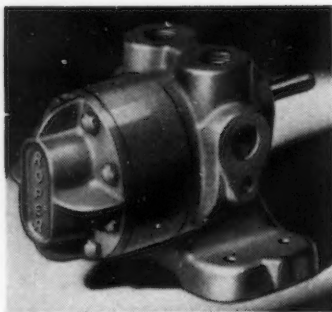
COMPACTNESS of design and unusual resistance to wear and abuse are claimed for a new line of universal electric drills put on the market by the Chicago Pneumatic Tool Co., 6 East 44th Street, New York. The motor has high torque and is available in three speeds. There is only one pair of helical gears in the case and all bearings are ball bearings mounted in steel inserts. For air intake fine holes are perforated in the end of the handle where they will not be covered by the hand. The switch is a two pole inclosed mechanism with close fitting trigger attached. Built in capacities up to $\frac{1}{4}$ in., this same tool can also be supplied as a screw driver for $3/16$ in. machine screws or as a nut runner for $3/16$ in. nuts.



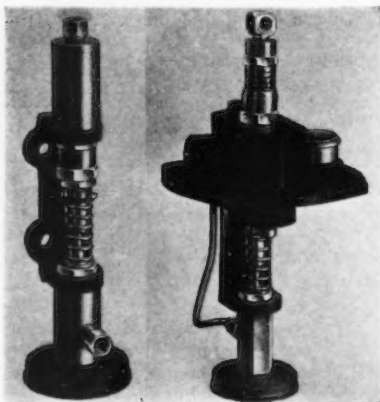
NO. 1C cam vise, made by Brown & Sharpe Mfg. Co., has the fixed jaw attached to the mid-section of the body and the movable jaw at the end, with a tongue extending under the fixed jaw. The cam pivot is clamped to this tongue and may be adjusted lengthwise to take care of variations in jaw openings. A pin in the vise body moves in a groove in the under side of the cam and provides positive release. This vise is for holding duplicate pieces that do not vary in size more than $5/64$ in. Jaws are $4\frac{1}{8}$ in. wide. Tongue slots at right angles permit vise to be set either lengthwise with the table or at right angles to it.



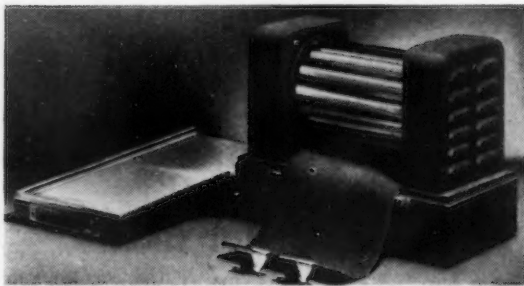
A NEW miniature reversible ratchet, only 4 in. long, and four new drivers are now available for the miniature detachable head wrenches made by the Armstrong Brothers Tool Co., Chicago. The ratchet is of improved design, with hardened gear and instant reversing thumb switch. The drivers added are a flexible head handle, a screw driven type extension spin-grip that permits locking head so that it can be used as a spinning extension, and long and short extensions.



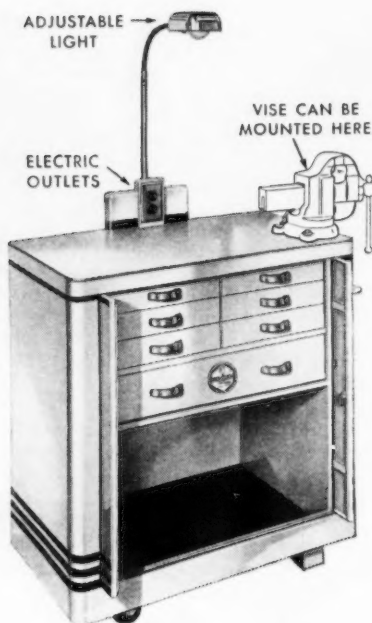
HYDRAULIC balance by which internal pressure is equalized at all points and shock or thrust from the power end of the drive shaft is absorbed is featured in a new line of gear pumps introduced by the George D. Roper Corp., Rockford, Ill. The pump is built in capacities from 1 to 1000 gal. per min. and against pressures up to 1000 lb. per sq. in. At present 21 different drives and mountings are available. Other options include: Spiral, spur or herringbone gears; conventional packing box, spring loaded packing box or mechanical seal; sleeve or roller bearings; built-in or external relief valve, and eight different piping arrangements.



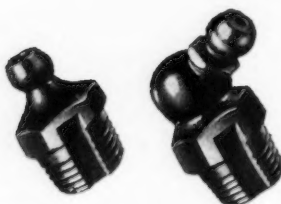
RECIPROCATING plunger type lubricators actuated by a co-axial piston driven by the hydraulic system of the machine tool or other productive machinery are now being supplied by the Bijur Lubricating Corp., Long Island City, N. Y. During the low pressure period of the hydraulic cycle, the complete piston and rod assembly moves under the action of a spring to one end of the stroke, drawing a definite amount of oil into the lubricator cylinder. Then during the high pressure period the assembly is forced to the other end of the stroke, discharging oil to the distribution system. The usual cycle is from 5 to 50 sec. or more. Max. stroke is 1/2 in. Type C lubricator is arranged for mounting on a standard 2 or 6 pint oil reservoir. Type G is particularly adapted to mounting in a reservoir cast integral with the machine.



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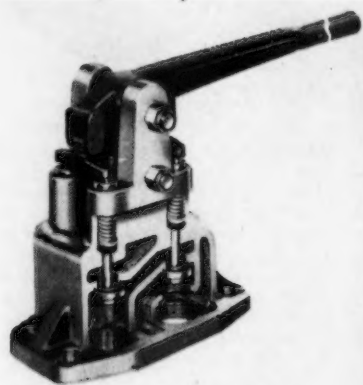
A SPECIAL allowance on old wrenches is being offered as a trade-in value toward two special Blackhawk wrench sets, the 100DD illustrated and set 35B. The 100DD assortment contains 87 Nugget socket wrenches, box types and other tools having 7/16 in. drivers. Hexite steel gives the same strength as 1/2 in. drive wrenches, but they are one-third lighter. The 100DD set also has 1/4 in. drive sockets and handles and a set of 3/4-in drive heavy duty sockets and handles. The trade-in offer is made by the Blackhawk Mfg. Co., Milwaukee, between March 1 and June 30.



A LEMITE Lubriguard fittings and bushings signal the operator when to stop in loading anti-friction bearing housings with grease. Lubricant is forced through inlet of hydraulic fitting and when a predetermined amount of backpressure is developed in the housing, excess lubricant appears at the vent slot. Bushings, not shown, are provided to permit bearings now equipped with button head Dot, pin type and other conventional gun fittings to receive Lubriguard protection without discarding the original fittings.



LIGHT types of insulation can be stripped from round, flat or rectangular solid or stranded wire with the No. 9-C power driven, brush type wire stripper, announced by the Ideal Commutator Dresser Co., 1925 Park Avenue, Sycamore, Ill. A 1/4-hp. motor drives the special wire brushes, the speeds of which are synchronized through an auxiliary flat belt drive which also operates a vacuum exhaust. There is provision for adjusting the brush clearance, but spring action allows assorted sizes of wire to be stripped without frequent adjustment of brushes.



HEAVY duty air control valve recently designed by the Ross Operating Valve Co., Detroit, for steel mill and other severe duty. Special lever and rocker arm pins of increased diameter, fitted with needle type roller bearings, larger stuffing boxes, stainless steel poppet stems and retainers and other features are said to provide this valve with extra strength and wear resistance beyond what actual usage will demand. Mounting and pipe connection locations and bolt holes are the same as in the standard Ross valves, allowing for ready replacement.

A NEW brilliant light source has recently made possible the development by A. B. Dick Co., Chicago, of a method of making duplicate copies of line drawings in quantity. By exposure to this light in the mimeograph photochemical printer, any opaque drawing on translucent cloth or paper can be transferred to a sensitized stencil sheet. The stencil is then developed and placed in the mimeograph duplicator for accurate black-and-white reproduction in quantity in the conventional manner. Time of the procedure from finished tracing to finished copies is generally less than 25 min. Included in the original assembly are the portable printer, developing plate, and all necessary accessories except chemicals and stencil sheets.

MANUFACTURE OF FISH HOOKS

A RUSTPROOF hook with steel-like strength made of "Z" nickel, a heat-treatable alloy containing approximately 98 per cent nickel, is now in commercial production in this country. Corrosion protection in salt water in the past chiefly has been limited to plated or otherwise coated hooks. The materials which were able to withstand sea water corrosion adequately for the most part failed to provide the physical properties required in hooks. Corrosion resistance of the new hooks extends all the way through the metal.

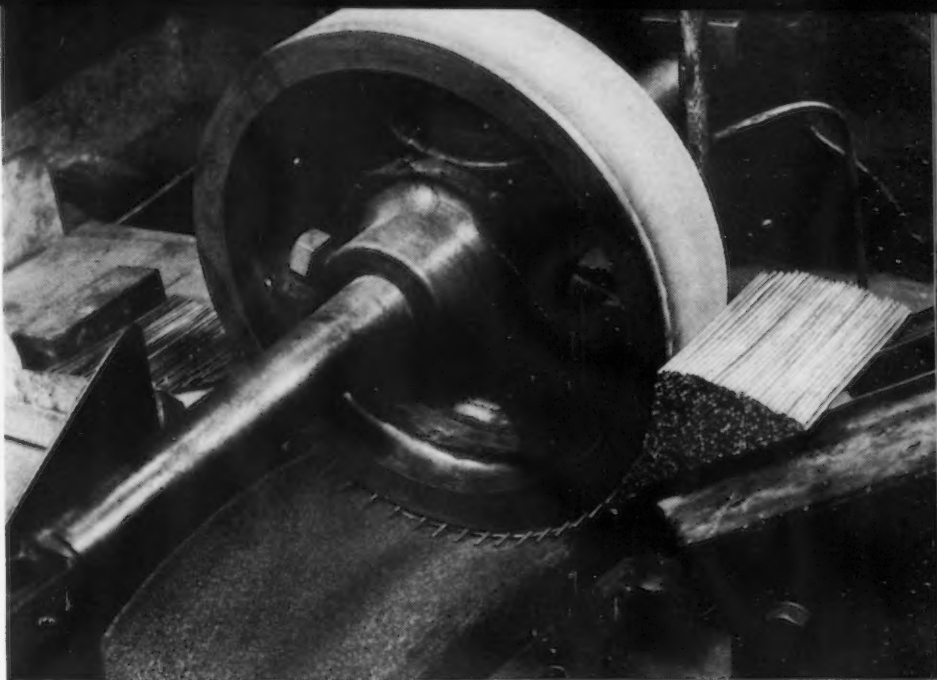
This new hook is expected to cut into sales of imported hooks, of which \$300,000 worth was imported in 1938, representing about 33 per cent of the year's total sales.

The new "Z" nickel finish hooks—a product of Bill DeWitt Baits, Division of Shoe Form Co., Auburn, N. Y.—are made by a combination of automatic and manual operation. At present they are produced in five O'Shaughnessy style sizes for a range of fish from the small mouthed flounder to the tuna.

After coiled wire is automatically straightened and cut into desired lengths, production of the fish hook (upper photo) begins with the grinding of the point by passing the cut blanks over a sharpening wheel. Special equipment is used to cut the barb, after pointing.

The pointed and barbed blank is bent around a die to provide the required shape (middle photo). Separate dies, shown in the left foreground, are required for each hook type or design.

The eye of the hook is made after other operations are completed in a machine (lower part) which, like others used by the industry, is of special design and construction.



Tool Engineers Hold Successful Meeting In New York

THE rapidly growing American Society of Tool Engineers held what is considered to be its most successful annual meeting at the Hotel New Yorker, New York, March 7 to 9. Over 650 members and guests registered, a record for purely technical sessions since no show was held in connection with the annual meeting this year. The board of directors did vote, however, to hold a machine tool and progress exhibition at Detroit in March, 1941, the scene of two similar exhibitions held in 1938 and 1939. During the three days at New York about 30 speakers were heard on various phases of tool engineering.

At the banquet on Friday evening, about 550 persons heard James R. Weaver deliver the presidential address as the retiring officer and saw the newly elected officers sworn in. For the coming year, A. H. d'Arcambal, consulting metallurgist, Pratt & Whitney Division, Niles-Bement-Pond Co., is the new president. Other officers for 1940-41 are: first vice-president, Edward W. Dickett, proposal engineer, Sundstrand Machine Tool Co., Rockford, Ill.; second vice-president, Eldred A. Rutzen, chief tool designer, Cutler-Hammer Co., Milwaukee; secretary, Conrad O. Hersam, consulting tool engineer, Philadelphia; and treasurer, Frank R. Crone, chief tool designer, Lincoln Motor Car Co., Detroit. Ford R. Lamb was re-elected executive-secretary of the society. It was announced that the semi-annual meeting is to be held in October at Cincinnati.

Mr. Hersam, as retiring chairman of the membership committee reported that the society now numbers about 4300 members, 1500 of whom were added to the rolls during the past year. The group is now international in character, having added a Toronto chapter during the year, and the geographic representation in the United States now extends from Springfield, Mass., in the East to San Francisco in the West and Houston, Tex., in the Southwest. The Hartford chapter was awarded a gold loving cup for having brought in the most members during the past year under the leadership of Ray H. Morris, chapter chairman.

At the banquet, Prof. John R. Younger, Ohio State University, presented the third report of the fact find-

ing committee on unemployment in industry. He indicated that the major factors in unemployment in the United States in the last 10 years have been population gains and immigration, since the number of persons employed in industry in 1937 was somewhat above the number employed in 1929. Scientific management is not to blame for the large numbers of unemployed since scientific management has as its object the elimination of waste and is synonymous of good management. Poor management, on the other hand, contributes to waste and failure and causes unemployment in the final analysis. Bad management employs fewer persons for shorter periods than does good management, since good management not only eliminates waste, but keeps prices at levels low enough to attract steady business and therefore is able to offer steady employment.

Professor Younger indicated that taxation and the burdens or restrictions of Federal legislation affecting business were factors in keeping employment down since their net effect is to reduce the funds available either for higher wages or for plant betterments

that would result in cost reductions and wider sales. Furthermore, Professor Younger indicated that government regulation and interference particularly tended to hold back the development of small industries. Production of new wealth creates employment, but the small business man has been afraid to make new ventures with his savings. Experience of the past seven years has proved that government spending does not add to employment, and the increased tax burden is a further hindrance on business initiative. New outlets to business spending is the road to re-employment, Professor Younger concluded, not further government spending.

President's Address

In his presidential address, Mr. Weaver elaborated on the factor of taxation as related to employment and the standard of living. Real purchasing power of wage earners has not risen as fast as the increase in his pay envelope because of taxation. The commodity of today is produced at much lower cost than that of yesterday, but the Government imposes processing taxes and sales taxes which the con-



A. H. d'ARCAMBAL
Newly elected president of the
American Society of Tool Engineers



JAMES R. WEAVER
Retiring officer of the A.S.T.E. who
delivered the presidential address

sumer must pay. When taxes and other Government restrictions add to the manufacturing cost, this increase must be offset by a reduction in labor content of the product, obtained by improved manufacturing facilities. But regardless of whether the labor content is reduced or maintained, the amount of commodity consumed determines the total amount of labor needed. If the price is high, distribution falls off, and less labor is needed.

This policy of producing things more and more efficiently in order to lower manufacturing costs requires an increasing amount of skilled labor, because the problems of industry are becoming more difficult. Today, however, we find employment agents scouring the country for skilled workers, and despite the 9,000,000 unemployed, they are not having much success. An astonishing percentage of these unemployed are ill fitted physically, mentally or by training or education to fill the urgent needs of industry. Each year our educational institutions grind out graduates by the hundreds of thousands, and, unfortunately, a good share of them go into the labor warehouse, along with the other nine million or so. Industry has been maligned by educators and legislators alike because it refuses to "buy" these surplus labor commodities, but few have wondered whether perhaps there might not be something fundamentally wrong with an educational system which continues to turn out workers that are unmarketable, even though help is urgently

needed. A large part of our horde of unemployed—about four million, in fact—are young people, Mr. Weaver continued—fellows who have gone through school with high ambitions, eager to work at the kinds of jobs for which they have trained themselves, and yet they are repeatedly turned away from our employment offices. Yet, in foreign countries the dictators go out of their way to impress upon youth how necessary they are to their country.

Youth in this country, Mr. Weaver maintained is poorly equipped for jobs in industry. Mere enthusiasm for work in the mechanics arts is not enough. They need to be trained for a career in industry from the time they enter high school. Only 15 per cent of our high school students ever go to college, and the remainder graduate mostly from academic and commercial courses with practically no training for useful positions in industry. If an individual has mechanical aptitude, he should be encouraged to develop it as far as possible by building and operating machines or designing his own machines or tools. Students with more analytical inclinations could be taught something about production methods, accounting or time study.

Industry on the other hand should become more interested in bringing more young blood into manufacturing establishments or business itself will deteriorate. Besides the problem of youth is a vast social problem that is a threat to the very existence of the

machine, to industry as a whole and to our national economy. There is first the selling job of convincing youth that industry wants them and needs them. We must strike at white-collar snobbery and convince youth that the maker of the products of commerce is as honorable and desirable a profession as that of the man who sells them. Our greatest ally in this program, Mr. Weaver stated, is the public schools. "Let us go to the educational authorities in our own cities and states and help establish new courses of instruction to fit young people for useful careers after graduation from high school. Then let's go to our colleges and universities not merely to suggest courses in tool engineering, but to offer our cooperation in establishing them and making them function." Once we have geared our educational machines to turn out graduates of the right caliber, our problem of securing more equitable legislation for our younger workers becomes greatly simplified. "I am convinced," Mr. Weaver continued, "that these actions to help youth are among the most important projects which we collectively as a society and individually as representatives of many industries, should attack."

Tool Engineering Education

Earlier that same day, a session had been devoted to a symposium on tool engineering education in which the viewpoints of both educators and industrialists were expressed. In defining what he believed to be the dominant qualifications of a man for success in tool engineering, Clifford S. Stilwell, executive vice-president, Warner & Swasey Co., Cleveland, placed greatest emphasis on broad traits of character rather than specific technical training in that field. The competitive system requires that a man deliver all he has and that is never more than enough. No engineering law is sounder than that the value of results depends upon the volume and quality of production, whether it be man or machine. Another element in the makeup of a tool engineer is that his education deal specifically with the development of his imagination. Lack of imagination is one of the greatest handicaps which management encounters constantly in organization and particularly in all branches of engineering, design, production and sales.

Furthermore, Mr. Stilwell said there seems to be no more important element in the qualification of a tool engineer than his ability to deal with people both cooperatively and in leadership. The most successful tool engineering is done with people. The tool engineer



EDWARD W. DICKETT
First vice-president, A.S.T.E.



ELFRED A. RUTZEN
Second vice-president, A.S.T.E.

must be able to convince his supervisors and the producers or workers of the validity of his scheme. Education should also give a better rating to personality.

Great importance was attached by the speaker to vocational guidance in the schools. The products of our schools could be greatly improved, Mr. Stilwell believed, if there could be more certainty of direction of the student toward his field of greatest aptitude before he finds himself on the threshold of business. There ought to be frequent contacts of business men either with clinical groups or large assemblies in our schools. In this connection and in the way of practical training in industry, Mr. Stilwell expressed the belief that the cooperative system of part time work in industry and part time in school is decidedly effective.

The College Viewpoint

The speaker who followed Mr. Stilwell, Dean J. W. Barker, College of Engineering, Columbia University, indicated also that other engineering societies were paying a great deal of attention to vocational guidance, and in New York City had set up an elaborate system involving the cooperation of hundreds of leading men in the engineering profession in counselling youth on careers in various branches of engineering. As regards tool engineering education, Dean Barker indicated that present thinking among engineering educators is away from specialized courses and toward a broad training in the fundamental science plus cultural courses in the so-called humanities. He expressed the conviction that such specialized branches as tool engineering should be given by post-collegiate training in industry. In analyzing the field of tool engineering, Dean Barker distinguished those types of jobs that could well be performed by technicians having vocational school training and industrial experience from those phases of tool engineering less empirical and more analytical in nature.

Training in college must be broad, basic and fundamental, rather than a preparation for the initial job in industry. Usually the student does not know what job he is going to get upon graduation, and if the course is too narrow, an irreparable damage may be done the student. The college can teach him machine design and applied mechanics, a brief outline of shop processes, metallurgy, economics of production and shop management, but his post-graduate training should be

along specific lines of tool engineering in the shop.

The need for more vocational training to fill the jobs in industry was also stressed by E. L. Bowsher, superintendent of schools, Toledo, who presented the high school viewpoint. Present day schools train about 90 per cent of young people for white collar jobs, whereas statistics show that of those gainfully employed 92 per cent work with their hands. He estimated that 70 per cent of youth are not trained for skilled jobs and that 40 per cent are not trained for any kind of a job. Mr. Bowsher urged adequate vocational guidance to acquaint students with job information, and a reconstruction of educational programs more in line with local needs. For students who are to enter the mechanical trades, he suggested the use of cooperative plans with industry in which students would be allowed to observe actual working conditions in industry. He thought such cooperative students should be merely observers and should not be producers.

The vocational high school will do the job of training technicians for industry, and the technical high schools must provide the sound preliminary background for those students who are to prepare for more technical work in the engineering colleges. Unfortunately, Mr. Bowsher admitted, good technical high schools are few and far between.

Vocational Training

Vocational schools are the natural place to train boys for the skilled trades, but the criticism was made by the following speaker, Thomas P. Orchard, that instructors in vocational schools have too much theoretical training and not enough practical work in the mechanic arts. Earlier, Mr. Bowsher had outlined the difficulty of finding men with practical training who had ability to teach or who could speak the English language sufficiently well to qualify as instructors.

Mr. Orchard, who is director of the Technical Evening Classes at Paterson, N. J., outlined the procedure used to train young men in tool design with night courses while they were working or attending day school. Only one night a week is spent in the classroom, but the classes are kept small and there is practically individual guidance and instruction. The work is of a highly practical nature and is entirely creative, there being no copying done, even in learning the rudiments of mechanical drawing. The student sets his own pace and completes the courses in his



CONRAD O. HERSAM
Secretary, A.S.T.E.

own time. The success of the plan depends upon the use of practical tool designers as instructors, Mr. Orchard himself being one. Most of those completing the course have been able to qualify in starting jobs in tool design departments.

The symposium on tool engineering education was opened by Herbert H. Hall, of Herbert Hall Co., Newark, N. J., who is chairman of the newly formed committee on education of the A.S.T.E. Don Flater, works manager of the Chrysler Division, Chrysler Corp., Detroit, reviewed the papers presented at this session and summed up. In agreement with other speakers, he stressed the necessity of industry cooperating with the schools in developing men. In defining the qualifications of a tool engineer, like Mr. Stilwell, he stressed such general attributes as native intelligence good common sense, and above all else the willingness to assume responsibility. He saw no reason why tool engineers should not feed into managerial positions in industry, such as the one he himself occupies.

Economics of Tooling

This was the first time that the A.S.T.E. had officially taken cognizance of the problem of training for industry, but the attention paid the subject made it the highlight of the meeting. Another subject of a general nature which formed the topic of the opening session on Thursday was that of the economics of tooling. The sev-

eral viewpoints were presented by executives of leading companies making large, heavy equipment in small lots and those representing mass production industries. The subject was introduced by Barney G. Tang, general superintendent, General Electric Co. He indicated that tooling for extremely low production or extremely high production was a simple matter from the economic point of view, but where the decision as to how much to spend for tooling was difficult was for a third type of production where the quantities are uncertain, the development new, the competition keen and changes



FRANK R. CRONE
Re-elected treasurer, A.S.T.E.

in design frequent. The tendency is to make tooling for such products of a more permanent type than is justified by the final quantities of parts produced. This tendency to overtool he traced to overestimating of the ultimate quantities by the sales department; overenthusiasm of the product engineer, who fails to anticipate design changes before maximum production is reached; and finally pride in craftsmanship of the tool department leading to too much perfection in details. Mr. Tang suggested closer cooperation between the tool engineer and the product engineer, as the former can recommend design changes which will simplify tooling and improve the product.

The necessity of the tool engineering department being in constant touch with the product design from its in-

ception was also emphasized in the example of tailor-made products where it is difficult to predetermine the life of the design and the expected quantity. This point was brought out by W. T. Stegemerten, superintendent of equipment methods, South Philadelphia Works, Westinghouse Electric & Mfg. Co., in speaking on tooling large products in small quantities. In general, he said, tooling is necessitated by manufacturing demands due to design, increased production, cost reduction, tolerances specified, replacement, quality, interchangeability, improvement in the art of manufacture and metallurgical advancement. There is latent economy in a replacement tool as well as in that of tooling for extreme accuracy at low cost. Nor does quantity alone decide the economy. It is necessary, he added, to take into account finish, accuracy, material loss and succeeding operations—these factors to be balanced against the basic machine tool cost, costs of cutting tools and their upkeep. Tooling for small quantities must be given the same close analysis as for large quantities to effect economies, particularly with respect to tooling for the proper machine. An analysis may show that some inexpensive tool may offset assembly cost and also aid in maintaining a balanced load on the equipment. By way of example, Mr. Stegemerten mentioned a recent attempt to justify tooling a small quantity part; the investigation developed into a major change of methods and



FORD R. LAMB
Continues as executive secretary of the A.S.T.E.

tooling of similar parts with large quantities, effecting an ultimate cost reduction of 65 per cent. The use of adequate tool record cards are very handy in this regard, he pointed out.

Need of Tool Records

The following speaker, J. M. Crawford, assistant superintendent, generator and motor section, General Electric Co., also pointed out the necessity of having up-to-date records on all tools, dies, molds, gages, etc., so that design can be made to take full advantage of existing tools. At General Electric, through the medium of the planning department, simple catalog records of existing tools are maintained in both the engineering and the manufacturing departments. Preplanning of the major operations is done while the design is still on the board. At this time, full consideration is given to methods of manufacturing, taking into consideration economies of tooling and the kind and type of tools necessary to give the lowest unit cost. The tool engineer, the chief draftsman, head planner and the general foreman take part in this preplanning. Then all operations are reviewed by a committee representing all phases of manufacturing and engineering, and careful consideration is given to the effect that new or improved tools will have on the unit cost.

Mr. Crawford indicated that while in general the cost of tools must be liquidated on a unit cost basis, tooling must be given consideration on specific jobs for reasons other than cost advantage, such as where supply parts must be shipped on short notice. Process time can be reduced by the use of universal tools adaptable to a limited range of sizes. Here, the service to customer outweighs increase unit cost.

Commenting on the trend in the last 10 years to the use of welded fabricated design in place of castings, Mr. Crawford mentioned that studies of tool equipment revealed that for parts produced in the quantities encountered, lower unit cost in general is obtained with fabricated design. Machining time is reduced, there is less metal to remove and there are no patterns nor casting losses to contend with. During the processing of such large units, much use is made of portable and especially designed universal tools because it is simpler to bring the tool to the work than vice versa. In order to get the most economical use of these tools, thorough studies must be made of the planning of the various lines of apparatus and the factory layouts made from these studies to enable the various parts to

be processed with a minimum amount of material handling. Studies must be continuously made of capacities on production centers at various factory loads, Mr. Crawford concluded.

Tooling Small Products

Speaking of the tooling for the manufacture of small products, F. E. Darling, wage standards department, Eastman Kodak Co., indicated that the proper amount of money to spend on tools is the amount which when combined with the cost of producing on these tools gives the lowest possible combination cost. Mr. Darling then illustrated charts showing the theoretical relationship of unit cost to tooling costs and the labor cost with varying quantities. For any given volume of production, labor cost decreases rapidly as the tool cost rises, but the combination of the two has a well defined minimum point corresponding to a definite degree of tooling. When tooling cost becomes excessive, the unit cost begins to rise.

In actual practice, Mr. Darling believes that typical tooling cost charts can be prepared covering typical operations from which one can determine fairly accurately what amount of money is justified for tooling a given quantity of parts. For each typical part, he suggested making a tooling analysis for various quantities, starting out with the job made by hand tools and going up to full automatic tooling. As yet, such charts have not been actually developed at Eastman Kodak, however.

W. J. Peets, assistant superintendent, Singer Mfg. Co., approached the same problem from a different direction. He believes that the function of the tool engineering department is to tie together the product development department and the manufacturing departments. The general problem is usually to bring out a more desirable product at less cost and thus increase the sales volume against competition. This generally means the new model will make use of new materials and new methods of manufacture to achieve the desirability of the product and low cost, the combination of which determines the sales volume of the product. More often, the sales volume is not known when the tooling is first laid out. The question is rather will the sales volume warrant the capital expenditure for tools and equipment.

Careful analysis of each part and each operation is necessary in making such a study, including collection of data on the type of equipment on which the work is to be performed, the types of tools, jigs, fixtures or cutters, the

estimated cost of making or purchasing such tools or machines and the cost of all gages necessary. At Singer, the sequence of operations and the operation costs are determined jointly by the engineering department and the manufacturing department. The cost department sums up these costs and adds the overhead. From these data, the management reaches its decision as to whether to proceed with the new product or not.

Precision Small Gears

Another symposium was devoted to the subject of the manufacture of precision small gears. In this connection, Thomas Turner, manager of the meter division, Westinghouse Electric & Mfg. Co., Newark, N. J., indicated that the war in Europe has cut off the supply of some high grade foreign machines for cutting small gears and that this situation afforded American machine tool builders the opportunity to step in and capture this market. He indicated, however, that the well-known Mikron hobbing machine is still available from Switzerland. Some of the machines at Westinghouse were made by American firms no longer in business and some were made by the plant itself, as is so often true in the watchmaking industry. The machines in use are all of the form milling type in which a highly accurate profile cutter is traversed across the blank or blanks which are indexed at the end of each stroke. Some small pinions are cut integral with the shaft which is later finish turned in a turret watch lathe. Mr. Turner believes these turning operations could be combined with the pinion cutting, but there is no machine on the market at present to do this combined work.

Two American machine tool builders were represented on the program to outline the latest commercial apparatus for cutting precision small gears. George H. Sanborn, sales engineer, Fellows Gear Shaper Co., Springfield, Vt., illustrated two new types of gear shapers specifically designed for small work. The Fellows straight line gear shaper, limited to external cutting only, incorporates gap type rack cutters which travel in a straight line in a clapper box type of holder at speeds as high as 2000 reciprocations per min. The Fellows fine pitch gear shaper, suitable for generating either internal or external gears, uses a circular or pinion type cutter such as employed in the standard gear shaper. The cutter spindle is held in a relieving type of saddle and is also capable of being reciprocated up to 2000 strokes per min. Either type of

machine can be equipped with a magazine feed for automatic operation. The problem of holding the blanks is paramount, and Mr. Sanborn illustrated many ingenious methods of supporting gears of small diameter in stacks.

The problem of holding these tiny blanks was also found to be a paramount issue in the development of the type S Barber-Colman gear hobber, described by S. M. Ransome of that company. The basic machine was designed by a large Eastern clock manufacturer, and was perfected by Barber-Colman Co., of Rockford, Ill. This is an automatic machine with magazine feed. Production ranges from 100 to 2000 pieces per hr., depending upon the specifications. Accuracy on a 1/2-in. pitch diameter gear is within 0.0002 in. for adjacent tooth error, and 0.0004 in. for non-adjacent. Tooth form accuracy depends in a machine of this size largely on the hob, its initial accuracy, the trueness with which it is sharpened and with which it is mounted on the spindle. In clock brass, such hobs have cut almost 60,000 linear feet of teeth in gears of 94 d.p. between grinds.

Another speaker on the gear program was Arnold Thompson, chief tooling engineer, Canadian Acme Screw & Gear Co., Ltd., Toronto, who discussed general principles of gear tooth generation. Reducing the problem to its simplest elements, he illustrated the method of cutting worms and wheels with a single flycutter, with the aid of a simple fixture mounted on a lathe carriage. He also illustrated some ingenious devices for cutting gears on turret lathes and automatic screw machines at the same time the blank is produced.

Screw Machine Tooling

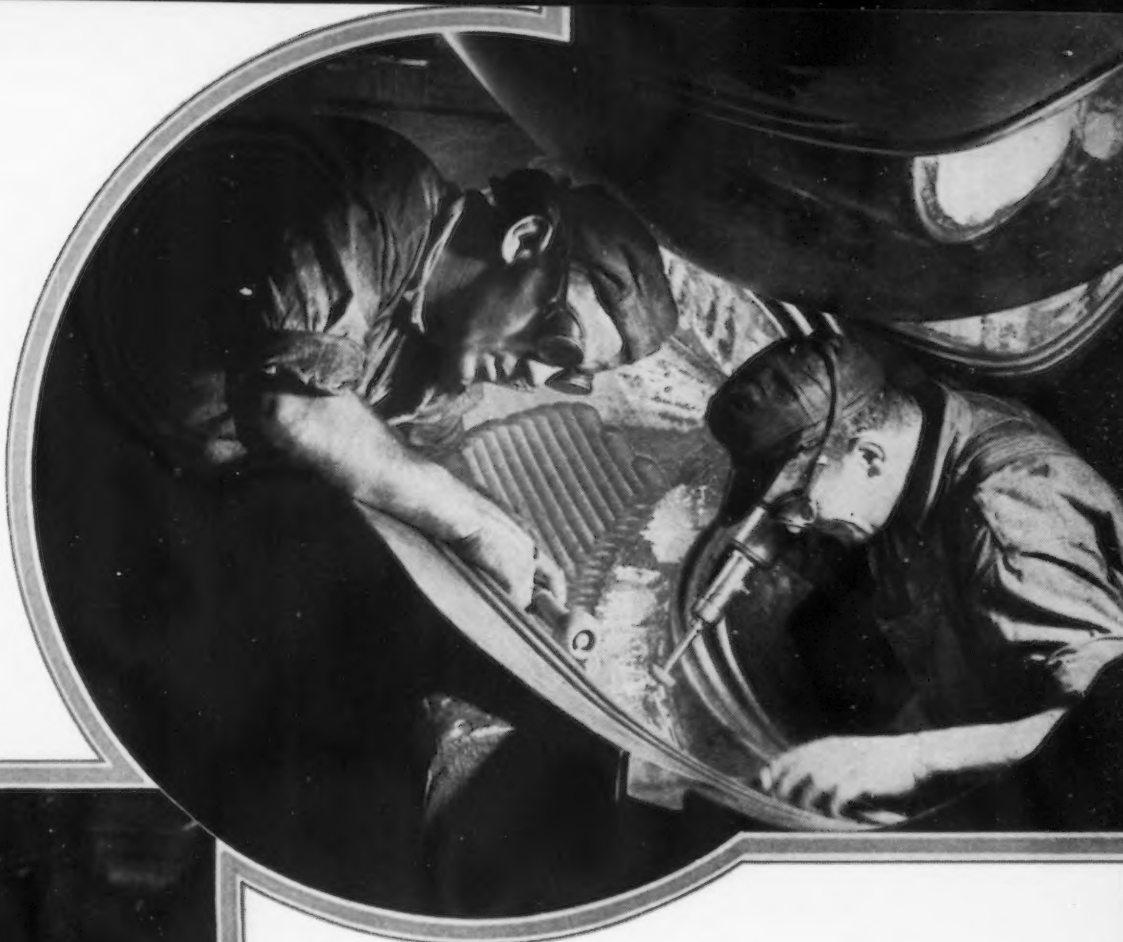
A number of papers covering specific details of screw machine tooling were presented. Harold P. Berry, senior tool and gage designer, Naval Gun Factory, Washington, speaking of the need for top rake on form tools, indicated that such modification increases the life of the tool and materially adds to the number of pieces between sharpening grinds, besides producing a smooth finish, reducing chip difficulties and improving machinability. With top rake on circular and form tools, higher spindle speeds are possible since the cutting action generates less heat and there is also less chance of "metal cling" at the cutting edge.

One reason why top rake or hook is not used more often is the tedious calculations normally involved in com-

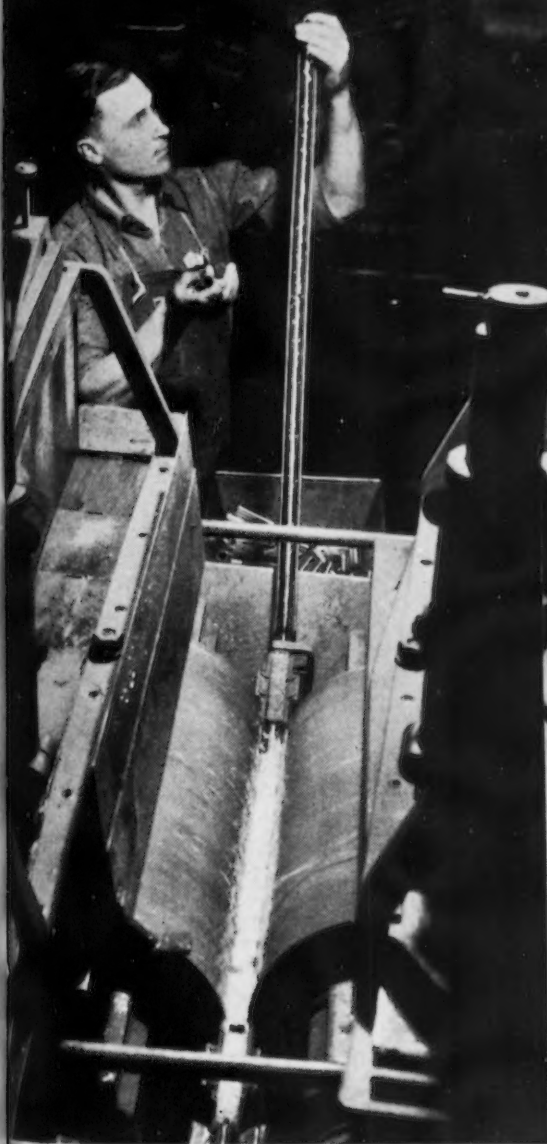
(CONTINUED ON PAGE 82)

It Couldn't Be Done By Hand

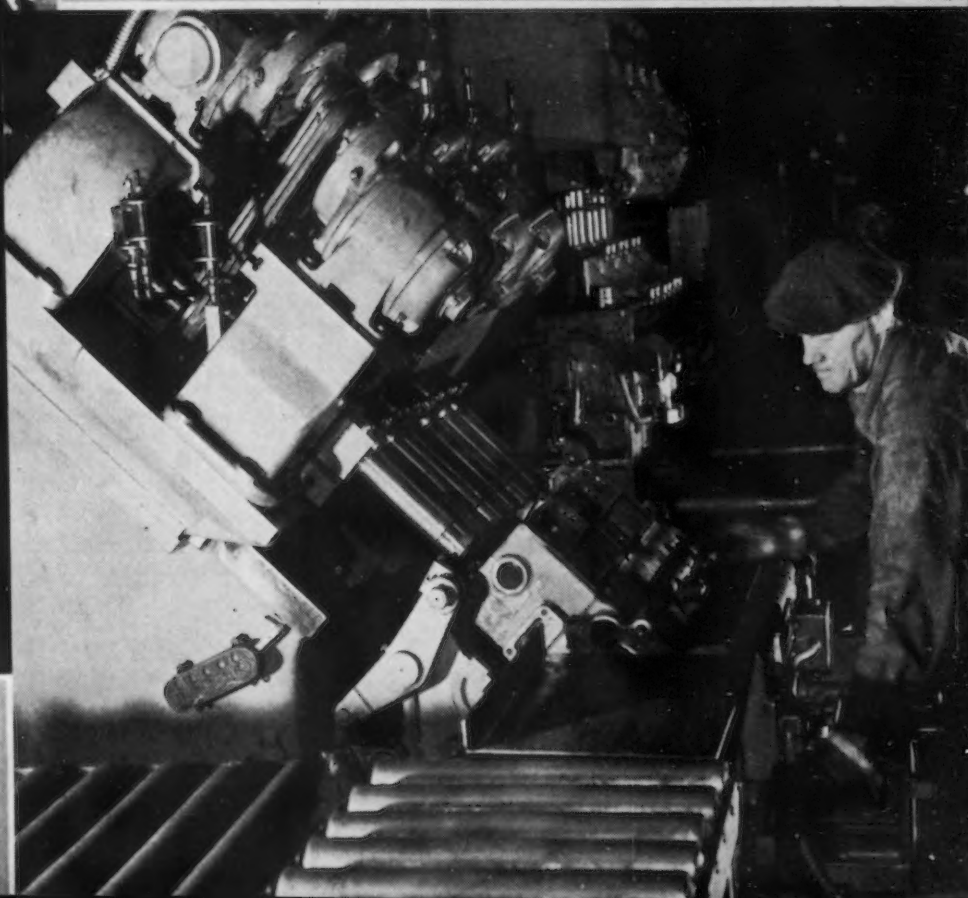
AT the right, die setters are shown at work matching a set of costly fender dies in a giant press. Only since the days of large scale production have fenders and dies like these been possible. Die cost per stamping would have been prohibitive when only a few cars a day were turned out.



WITHOUT large quantity production, precision machinery like this multiple spindle, single point precision boring machine shown below would not be economically possible. If manufacturing were back in the hand made stage, cylinders could not be finish bored with the same degree of precision, and if they could, it would take a skilled mechanic a week to turn out one six-cylinder engine. This machine finishes cylinders straighter and rounder than can be done with hand tools and accurate from end to end within 0.0003 in.



CONNECTING rod wrist pins are the most accurate part of an automobile engine. The photograph above shows the centerless finish grinding of such wrist pins to a tolerance of 0.0001 in. Photographs by courtesy of the Pontiac Division, General Motors Corp.



THIS WEEK

By W. F. SHERMAN
Detroit Editor

ON THE

ASSEMBLY LINE

... Production surges to 103,560 units as two independents resume assemblies ... Industrial buying cautiousness revealed in report for last month ... Stinson Aircraft plant at Nashville, Tenn., will remove operations from Detroit ... GM severance wages announced for salaried employees ...

DETROIT—The highest production level in a month and a half was reached last week by the automobile industry, responding to early Spring demand which indicates a satisfactory seasonal expansion in new car sales for the remainder of March. Output for the week was reported at 103,560 passenger cars and trucks, a substantial increase over the 100,855 reported in the previous week, according to *Ward's Automotive Reports*. The rise parallels a similar movement which began a year ago, although production then was only 84,095 for the corresponding week.

Packard and Willys-Overland assembly lines are in operation again after being down, and the week's total output was increased also by addition

of a fifth day to some Ford operations and a slight gain in Chevrolet. Ford-Mercury production was estimated at 21,000, an increase of 250 units. Chevrolet's gain of 1,000 units put it at the 27,000 mark, while General Motors volume climbed to 45,740 from 44,690. Gains were offset by a Chrysler reduction from 26,375 to 23,365. Plymouth eased off from 12,375 to 10,550.

Along with indications that the February summation will show automotive sales volume about 33 per cent above that for February, 1939, there are reports that used car turnover was at a rate that resulted in some decline in second-hand car stocks. Steady gains during March are forecast, with the mildness of Spring weather a factor. Most automobile

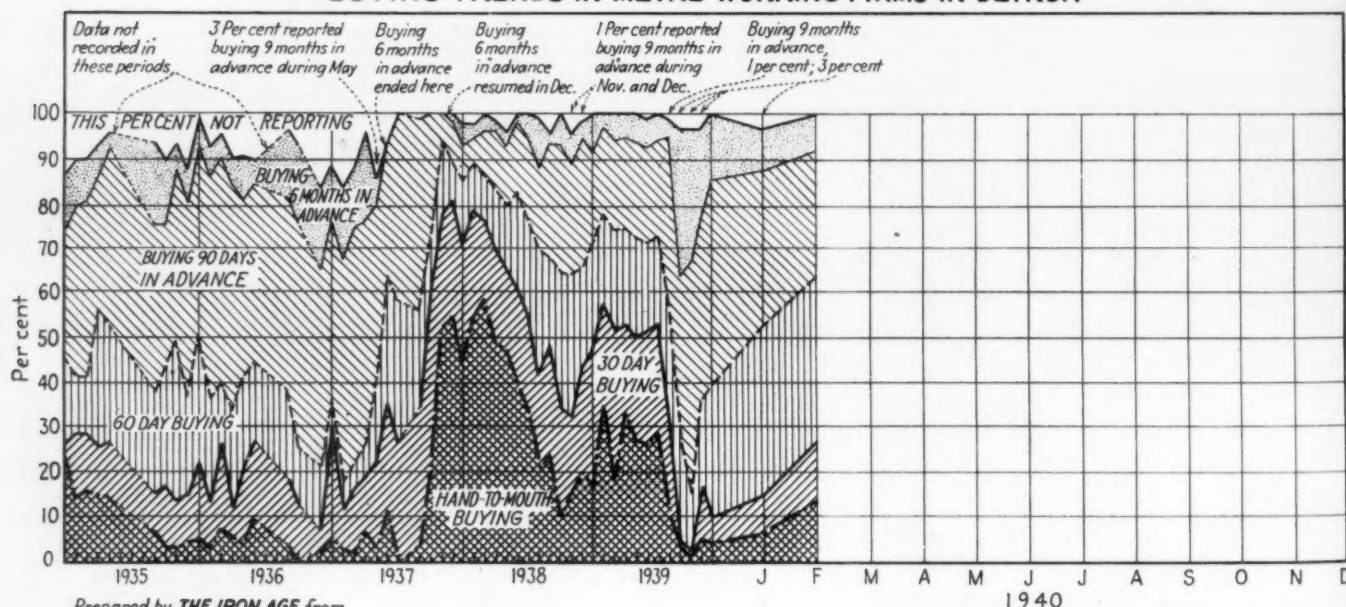
companies report that February was the best, or second best, February in automotive history, with individual company gains over last year up as much as 375 per cent (Willys).

The outcome of it all is likely to be a near-record for the first quarter. If March reaches the anticipated level of 440,000 cars and trucks, it would advance the total to 1,317,000 for the quarter, exceeded only by the 1929 period when 1,546,319 vehicles were built.

Futures buying of materials in Detroit showed a downward dip during February, although principal suppliers, like steel, report that the total volume of business during the month was higher than January. Cautiousness on the part of buyers is indicated, as short-term buying increased rather sharply during the month.

Just received is the report on buying trends, prepared by the Purchasing Agents Association of Detroit. Hand-to-mouth buying jumped upward from 7 to 14 per cent; 30-day buying moved up from 8 to 13 per cent. Fewer PA's bought 60 days ahead, a decrease of 2 per cent in

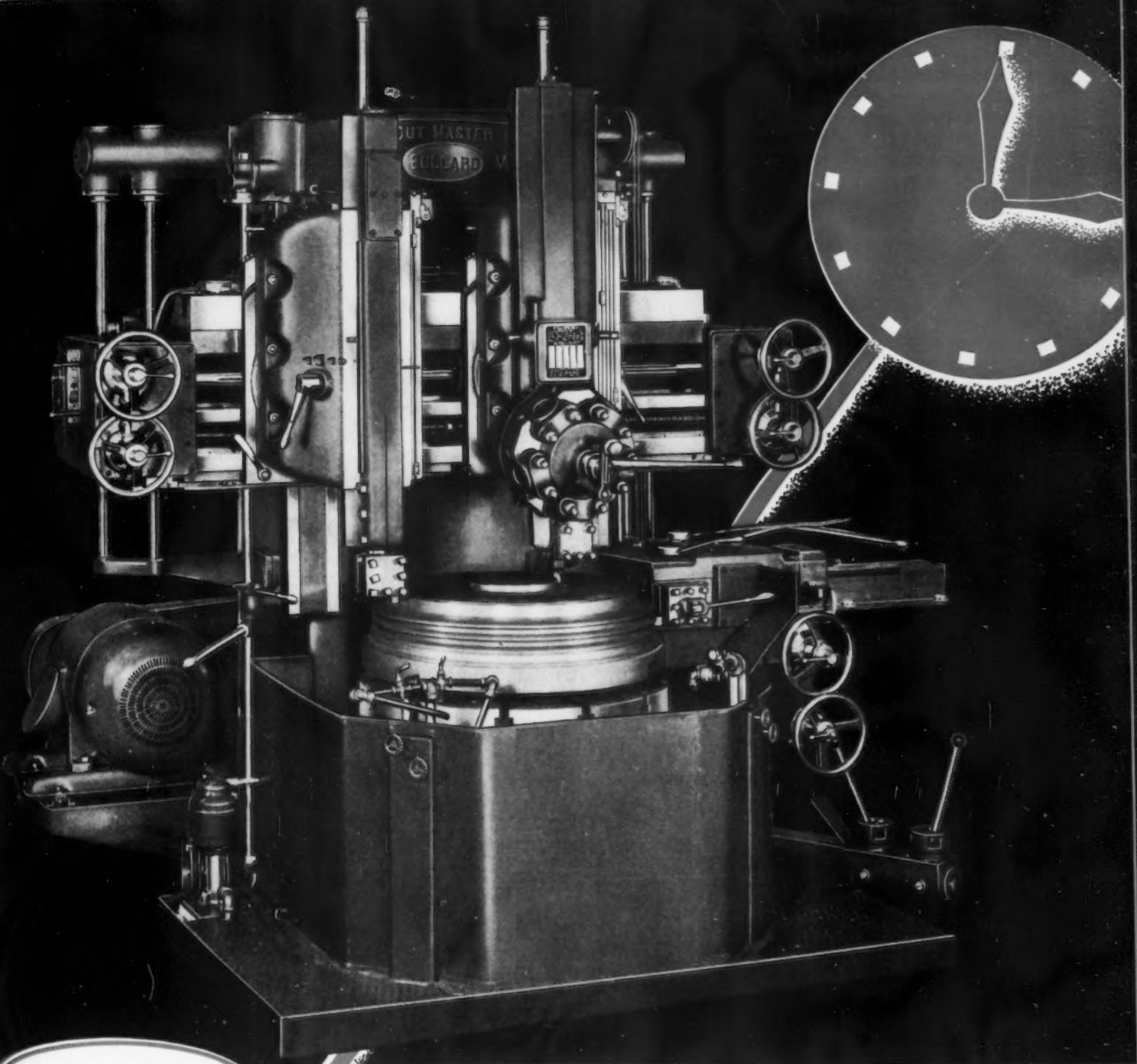
BUYING TRENDS IN METAL-WORKING FIRMS IN DETROIT



Prepared by THE IRON AGE from data supplied by PURCHASING AGENTS ASSOCIATION OF DETROIT

These data cover a wide industrial field, including stove, refrigerator, office equipment, steel, auto parts, accessory and auto plants

CUT MASTER



BULLARD

● Naturally. Cut Master is faster. Any two heads can be cutting while the third is being brought into position. And with rapid power traverse in all directions on all heads, you can save time between cuts, as easily as on cuts. However, if you can't use three heads, there are five other head combinations obtainable. Ask about these combinations.

Cut Master is something entirely new in Vertical Turret Lathes, in the speed and sustained accuracy of its operation. The "high points" given here are only a few of a great number, all contributing their part toward the quick acceptance of these new Vertical Turret Lathes. Send for the complete story, and be sure to tell us whether you are most interested in 30", 36", 42", 54", or 64" machines.

THE BULLARD COMPANY • BRIDGEPORT, CONNECTICUT

CUTS FASTER

this bracket bringing the group to 36 per cent of the total. This means that, in all, 63 per cent of the February buying in this area was for the short term, compared with 53 per cent on the same basis in January. The 90-day groups decreased from 35 per cent to 29 per cent of the whole, and the six-month group dropped off one point to eight per cent. There was an absence of buying for longer periods.

Factory employment in Detroit on the first of the month was higher than at any previous March 1 except in 1939, according to the Detroit Board of Commerce. The industrial employment index stood at 110.7, indicating employment of approximately 378,000 wage earners.

Moving of Stinson Aircraft Division of Aviation Mfg. Corp. to a new plant at Nashville, Tenn., takes away from the Detroit industrial area the only substantial slice of the aviation industry which it has possessed. Transfer of its principal operations will be made April 1. Whether the Stinson plant at Wayne, Mich., about a fifth the size of the new one, will continue to produce airplanes at all will depend upon the volume of business. About 200 key

men will be transferred to begin work on an order for 100 light airplanes ordered by the Army Air Corps. The plant normally employs about 400, with about 600 working in the months of peak production. Previously production was limited almost entirely to commercial aircraft. One consideration in making the move was the government's desire that all aircraft plants be remote from borders of the country. Stinson, in need of expansion anyhow, moved accordingly to a central location.

Salaried employees of General Motors Corp., totaling more than 40,000, will operate hereafter under a severance compensation plan announced last week by Alfred P. Sloan, Jr., chairman. In many respects this plan parallels the "income security and lay-off benefit plans" already in operation covering the hourly-rated factory employees.

The plan for the salaried workers provides that anyone with a year or more of continuous service who is released for reasons beyond his control will be paid a separation allowance. This will amount to 25 per cent of one month's pay for each year's service up to ten years. For each year's service in excess of 10 years

the allowance will be on the basis of 35 per cent of one month's pay. The minimum separation allowance is one-half of one month's pay, and the maximum is six months' pay.

Employees who are rehired are required to repay their separation allowance in order to reestablish their service credits with the corporation.

Aside from financial considerations, an important effect of the plan is the assurance that any salaried employee whose layoff or discharge is recommended by his department head will be given thorough consideration and review of his case before final action is taken. The Corporation will make an effort to retain employees for other suitable work. Also, complaints regarding layoff or discharge may be submitted to an official of the Corporation for final adjustment.

Another interesting step in employee relations work has been taken recently by two other automobile manufacturers. Ford has offered its 100,000 employees in Michigan a group hospitalization and medical service plan sponsored by 90 certified hospitals in the state and by the Michigan State Medical Society. Offered on a voluntary basis at a dollar-a-month rate the plan includes a \$1,500 policy on life, \$15 a week benefit for sickness or accident for a period of three months, hospitalization and surgical and medical care. The plan became effective March 1. Packard Motor Co. about the same time instituted a similar plan underwritten by a major life insurance company. Hospital benefits up to \$4.00 per day for a period of 31 days, special hospital charges up to \$20, and surgical fees to \$50 are included. The plan is offered to 17,000 employees at 75 cents per month.

A plan to place the entire automobile industry directly under control of the Federal Trade Commission and grant that body powers to prescribe rules for conduct of the industry is now being subject to referendum vote by all the dealers in the United States. Final date for receipt of ballots is March 30.

Behind this most unusual proposal for FTC control of the industry is long argumentation between dealers and manufacturers. The quarrel finally reached the stage where the National Automobile Dealers Association is weighing the direct backing of a proposed Federal bill sponsored by Congressman Wright Patman. The present balloting is a referendum to determine whether the bill should be pushed as dealer legislation.

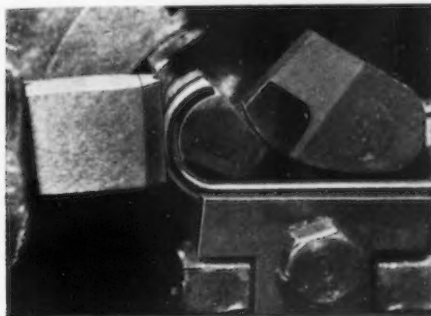
THE BULL OF THE WOODS

BY J. R. WILLIAMS



2,130 Miles of Wire Coiled With Carboloy Point

L. A. Young Spring and Wire Corporation, Detroit, reports that on one Carboloy coiling point they coiled more than 11,250,000 ft. of 7½ gage Swedish commercial type "OT" valve spring wire. In this plant Carboloy Points average 30 times the life of High Speed Steel points per refinish and require only one-half the time it takes to refinish H. S. S. points. Due to the extra



amount of stock removed in refinishing H. S. S. points, Carboloy outlasts H. S. S. 500 to 1 per inch of wear. Carboloy-tipped pitch tools and arbors outwear H. S. S. at approximately the same ratio. This performance is indicative of the results obtained by this company in coiling various sizes of steel wire from .008" dia. to ½" dia. for such products as automobile seats, clutch springs, brake springs, window regulator springs, mattress springs, etc.

Carboloy Sizing Dies For Bolts, Nuts, Roller Chain Cylinders, Etc.

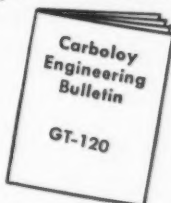


Carboloy sizing dies for bolt and rod work effect closer tolerances on pitch diameter of rolled thread, longer life for thread rolling dies and less down time on machine. Furnished in rounds or shapes for sizing bolts, nuts, etc.

As an indication of the economy of Carboloy sizing dies, one mill reports sizing 1,900,000 pieces of .07-.10 carbon drawn stock, with die wear of .0001". Reduction was .070".


Steel Cutting Recommendations Contained In New Carboloy Engineering Bulletin

A new engineering bulletin recently issued contains basic data on requirements for cutting steel with Carboloy tools. Gives tool design, set-up, coolants, chip breaking and machine requirements. Particularly valuable is a table giving specific recommendations for speeds, feeds, Carboloy grades, tool rakes and angles, etc. Ask for Carboloy Bulletin No. GT-120.



Carboloy Masonry Drills

Your maintenance man would like to know about the Carboloy Masonry Drill. Drills concrete, brick, tile, etc., 75% faster than old methods. Ask for leaflet GT-103.



When Warner & Swasey put Carboloy on 1500 small-lot jobs . . .

**MACHINE CAPACITY
INCREASED 43%***

**MACHINING COSTS
DROPPED 25%***

*Average of all Carboloy jobs

Is it economical and practical to use cemented carbide on small-lot, diversified machining work? That's the question Warner & Swasey asked themselves—set out to find the answer to in their own plant. Comparable to job shop work was the problem of W & S:—Lots range from 20 to 100 pieces. Steel, cast iron, bronze, etc., are machined. Operations include the usual boring, facing, turning, chamfering, etc.

To meet these conditions, a period of adjustment followed: Tool styles, sizes and grades (of Carboloy) were "boiled down" to a minimum number of general purpose standards; facilities for rapid grinding and maintenance of carbide tools

established; necessary controls on carbide use provided.

With this accomplished, the wheels started turning! Simple jobs at first. Then the "tough" ones—such as taking ⅜" to ½" roughing cuts over 37 linear inches of S.A.E. 1050 spindle forgings. Today 1500 successful Carboloy jobs are "on the record," with an average increase of 43% in machine capacity, and an average drop of 25% in machining costs. "Extra dividend" is the valuable source of carbide tool information now available to their sales-engineers—the men you rely upon for W & S Turret Lathe recommendations.

A 12-page booklet gives the facts—tool specifications, grades, speeds, feeds, etc. Yours upon request.

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★ FOR REDUCING WEAR ON EQUIPMENT OR PRODUCTS YOU USE OR MAKE ★

THIS WEEK IN WASHINGTON

... Wagner Act Amendments face stormy session ... Administration leaders block bill curbing New Deal agencies ... Wage-Hour division no longer assigns staff lawyers to industry committees.

By L. W. MOFFETT
The Iron Age

WASHINGTON—Described by a majority of the committee as designed to meet “only the most pressing needs” and by the minority as “emasculatory” and a threat to collective bargaining principles, the Wagner Act amendments proposed by the special House committee investigating the National Labor Relations Board face a stormy session ahead with a good chance of passage in the House after modification but with a poor chance of being approved by the Senate.

Administration lieutenants on Capitol Hill, who like to be recognized as enthusiastic adherents of collective bargaining principles are losing no time in mapping strategy to oppose the sweeping amendments which are embodied in a bill introduced by Chairman Howard W. Smith of the NLRB investigating committee. Mary T. Norton, Democrat of New Jersey and chairman of the House Labor Committee, promptly forecast that the House would not accept the amendments. Other members were equally emphatic in their prediction that it will be difficult, in view of revelations of NLRB antics uncovered by the special House committee, to stop the bill from reaching the House floor despite opposition from Mrs. Norton's committee.

Report Attacked by CIO

The CIO bitterly attacked the Smith committee report and announced that it will strongly oppose the proposed amendments to the Wagner Act. The AFL said the report is so exhaustive that no announcement of its position will be made until the report has been carefully studied. President W. Gibson Carey, Jr., of the Chamber of Commerce of the United States, has appealed to the country's businessmen to support vigorously the proposed amendments.

Under the House rules, the Smith bill could be brought before the House in 30 days if 218 members—a majority of the House membership—signed a petition to by-pass the labor committee.

Briefly, the amendments provide for a new three-man labor board shorn of all prosecution functions, give more recognition to the rights of employers than the present law, and call for the appointment of an administrator to prosecute unfair labor practices. Mr. Smith insisted his bill seeks to retain the philosophy of the present law because: (1) it in no way interferes with the right of labor to bargain collectively; and (2) it is predicated on the assumption that company-dominated unions are not to be recognized.

Specific Changes Proposed

Specifically, the Smith bill proposes these changes in the present law:

1. A new National Labor Relations Board of three members would have its prosecuting, administrative and judicial functions separated, the prosecution powers to be vested in a \$10,000-a-year administrator functioning independently of the board. This is designed to meet criticisms that the NLRB, as noted by the Circuit Court of Appeals recently in its Inland Steel decision, has been acting as “prosecutor, judge and executioner.”

2. The labor board's power would be limited to judicial review and to holding elections. At present, complaints go to regional directors to be formally passed on to the board. Under the new arrangement proposed, charges would be filed with regional directors who would be under the control of the administrator, or direct with the administrator, who would handle all investigations and prosecutions.

3. Provided there was no threat of

discrimination, intimidation or coercion, an employer could discuss any subject, including labor problems, with his men. Citing the fact that no law of Congress can interfere with the freedom of speech guaranteed in the Bill of Rights, the committee in explaining this amendment took a sharp crack at the NLRB interpretation of the Wagner Act, declaring that the proposed amendment on this point sets forth how far an employer may go in “expressing his opinion with respect to matters which may be of interest to employees or the general public.”

4. A collective bargaining election could be called only after application by an employer, or by his employees, but not on the board's own motion; and the board's services could not be invoked in a controversy between warring unions. This move to take the employer “out of the middle” would require opposing labor factions to agree on an appropriate bargaining unit before either could request an election.

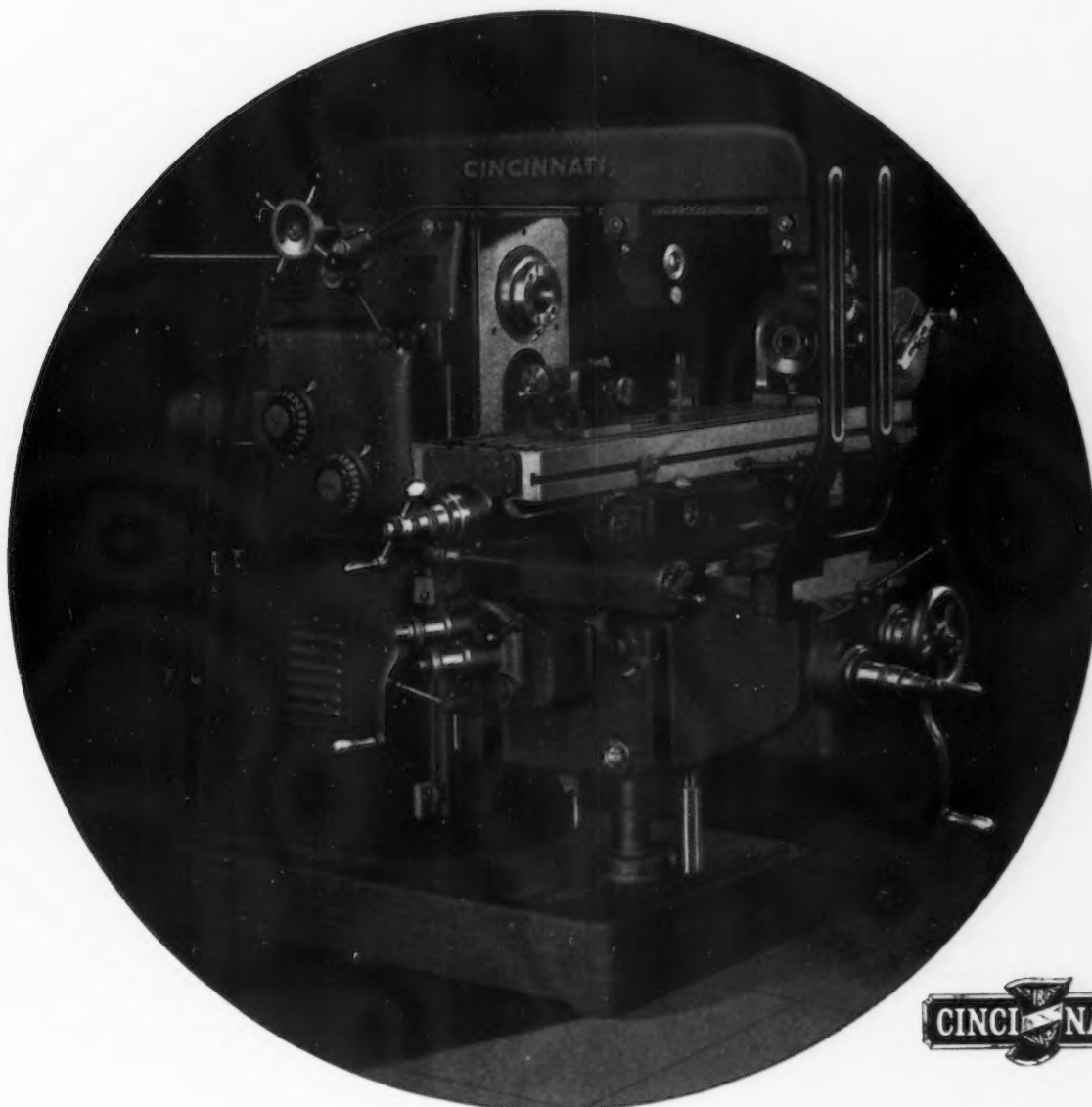
5. Reaching collective bargaining agreements or making counter-proposals would not be mandatory on the part of employers or unions. This provision, the committee said, follows the Supreme Court decision in the Jones & Laughlin case in which the court said there was nothing in the act to compel an agreement. In an attempt to write into the law the rule laid down by the court, the committee proposed to define the terms “bargain collectively” as including the requirement that an employer meet and confer with his employees or their representatives, listen to their complaints and make every reasonable effort to compose differences, but “is not to be construed as compelling or coercing either party to reach an agreement or to make counter proposals.”

6. A statute of limitation clause would require charges of law violation to be filed within six months after the alleged infraction; and no board order for back pay could cover more than six months. On this score it was explained that cases have been brought to the attention of the committee where the decision of the board has not been rendered until at least 18 months after the case was argued before the board, and in which the board has issued an order directing the payment of money during this entire period.

7. The board could reinstate no

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New arrangement of control levers, more natural movement of the hands in manipulating the machines.

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workers who wilfully engaged in violence, unlawful seizure, or destruction of property. This is in line with the Supreme Court's decision outlawing the sit-down strike in the Fansteel case. A preponderance of evidence showing that the employee had wilfully engaged in the unlawful practices would be sufficient to deprive the board of the power to order his reinstatement.

8. Language defining government policy to be that of encouraging collective bargaining would be stricken, leaving only the statement that Congress aims to do all it can to protect workers' exercise of that right. It was the view of the committee's majority that Congress should do everything possible to protect the right but "should not require the board to encourage unionization where employees do not want it."

9. Labor board hearings would be required to conform to usual rules of evidence. Under this provision hearings would be conducted so far as practicable in accordance with rules of evidence applicable in the United States District Courts.

10. Review of board decisions by the courts would be permitted in representation cases. Appellate courts could not set aside verdicts of the board unless they were not supported by "substantial" evidence or were clearly erroneous. This language was borrowed from the pending Logan-Walter bill which seeks to subject quasi-judicial agencies of the Federal Government to uniform administrative procedure.

Bar "Fishing Expeditions"

Reflecting throughout the measure the results of the committee's extensively publicized NLRB hearings, the bill also contained changes in regulations covering subpoenas to protect individuals against "fishing expeditions." Persons subpoenaed hereafter could appeal to the board, requesting the subpoena be quashed, if in his opinion it required the production of records not considered pertinent to the questions at issue. Subpoena enforcement machinery would henceforth be exclusively in the hands of the courts.

The committee also was severely critical of the NLRB's so-called economics division. It proposed that the

unit, consisting of 30 persons headed by David Saposs, be tossed overboard. The Saposs unit was under fire by the committee recently and Committee Counsel Edmund Toland raised the question that creation of such a division was not authorized under the act. Indicating there is no justification for the division under the present law, the committee said there will be even less justification for its existence under the proposed new law, which limits board activities to those of a judicial nature only.

WPA Says it Spends \$4,800,000 Each Month for Steel

WASHINGTON — The Works Progress Administration estimates that its works relief program results in an average monthly expenditure of \$4,800,000 for iron and steel products, and \$1,500,000 for machinery and equipment.

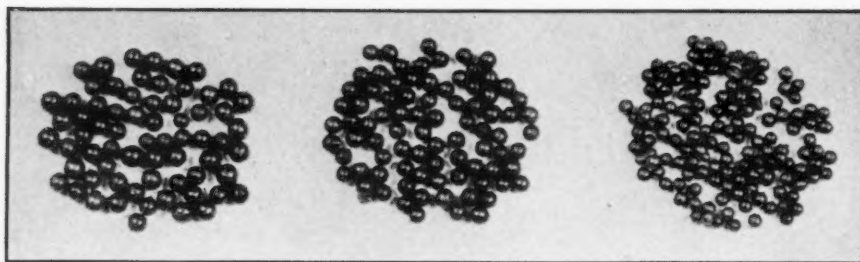
Broken down, the iron and steel estimate includes \$1,100,000 for cast iron pipe and fittings; \$200,000 for heating and ventilating equipment; \$1,100,000 for structural and reinforcing steel; \$300,000 for tools (excluding machine tools); and \$2,100,000 for unclassified iron and steel products.

Estimates on machinery and equipment purchases include \$1,500,000 for electrical machinery, apparatus and supplies; \$100,000 for paving and other road building machinery and equipment; and \$800,000 for other machinery not classified.

Industry Must Present Own Cases in Wage-Hour Hearings

WASHINGTON—Industry committees functioning under the Fair Labor Standards Act hereafter will have to present their own cases at public hearings because the Labor Department's wage-hour division has decided to discontinue the practice of assigning wage-hour staff lawyers to represent industry committees.

While the division has insisted that an assigned attorney represented only the industry committee and took no part in the consideration or drafting of the administrator's decision, some employers and trade association representatives, according to the wage-hour division, "seemed to feel that this attorney in some way represented the division." Because of this misunderstanding, the practice was ordered abandoned, the division said.



IN the period of one year we have built up a very large business with our Heat-Treated Steel Shot and Heat-Treated Steel Grit. This was accomplished on purely a quality product. Our many hundreds of customers, nationally known Concerns, are using our Shot and Grit, and sav-

ing money every day, blasting faster with less wear of abrasive. Our heat treating insures toughness and strength, fast blasting and long wearing. Try it in your machine and prove the truthfulness of these statements.

**We never
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A ton or a carload.
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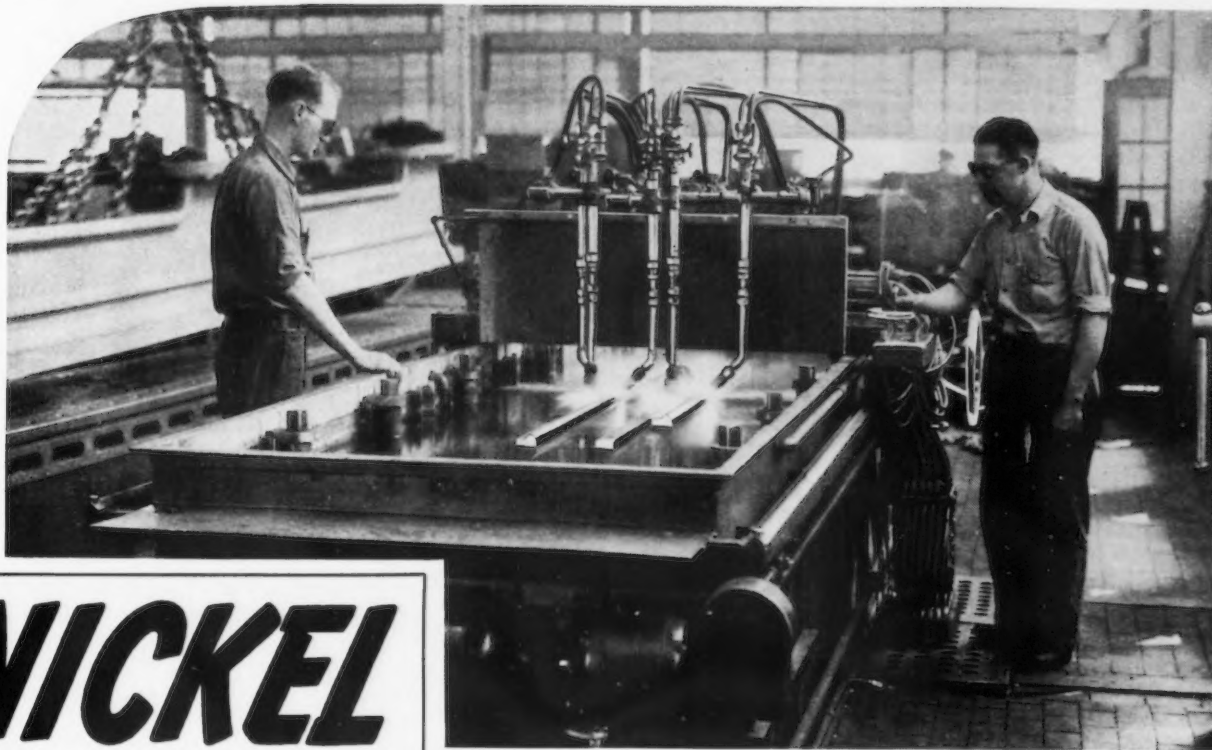
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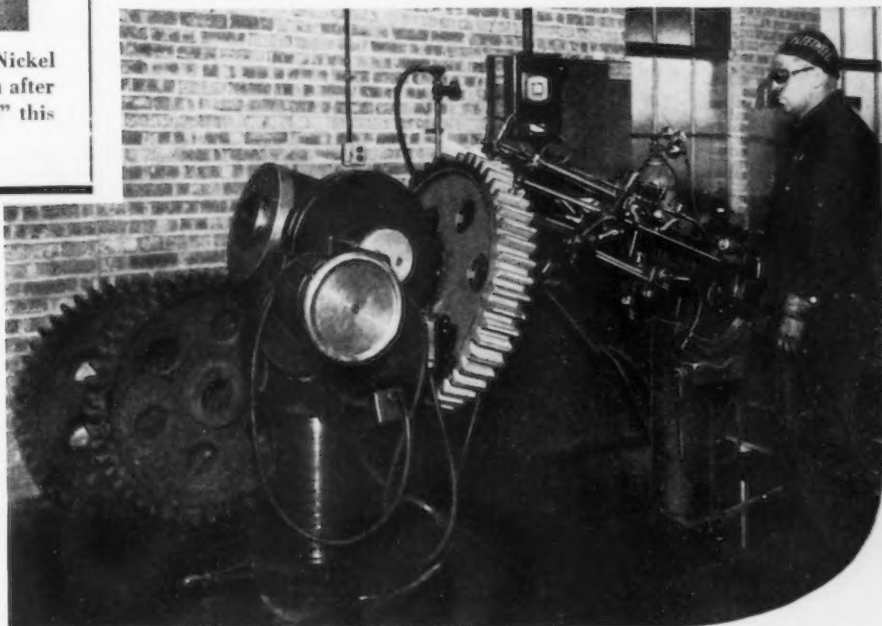
NICKEL *irons and steels*



A BROKEN cross-section of a Monarch Nickel cast iron lathe bed shows $\frac{1}{8}$ " penetration after flame hardening. Nickel tends to "blend" this hardened surface into the core.

NICKEL additions to cast iron tend to condition the metal for flame hardening operations. Here the Monarch Machine Tool Co., Sidney, Ohio, is flame hardening ways used on Monarch lathes. Travelling at 3" to 6" per minute, oxy-acetylene jets pass only once to raise the surface Brinell hardness of this Nickel cast iron from 225/240 to 450/460. Average composition is Total Carbon 3.00, Silicon 1.70, Manganese 0.85, Nickel 1.50, Chromium 0.30%. Monarch states "The use of a carefully controlled nickel alloy cast iron can be depended on to eliminate hard spots and also to stabilize that portion of the carbide in the pearlitic matrix necessary for flame hardening to the fullest degree."

NICKEL alloy steels are especially well adaptable for flame hardening. Photo shows Wesley Steel Treating Co., Milwaukee, simultaneously flame hardening both faces of teeth on a large gear. Cam segments of SAE 3150 Nickel-chromium steel are flame hardened by Wesley to 580 Brinell. For detailed information about Nickel alloyed materials particularly suited for modern heat treating methods, please write to the address below.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET
NEW YORK, N. Y.

U.S. Metal-Working Machinery Exports at \$117,473,885 for '39

WASHINGTON — Topping \$100,000,000 for the second successive year, American metal-working machinery exports totaled \$117,473,885 in 1939, a 16 per cent increase over the 1938 shipments valued at \$101,656,830, according to the Machinery Division, Department of Com-

merce. While shipments were made to practically all foreign countries during the year, the trade remained highly concentrated with four countries, United Kingdom, Japan, France, and Soviet Russia, received 81 per cent of the total.

Most types of metal-working ma-

chinery participated in the increased shipments in 1939 compared with 1938. Lathes valued at \$17,418,029 were shipped abroad during 1939, representing an 18 per cent gain over the 1938 exports valued at \$14,807,474. Shipments of the turret type advanced by 25 per cent for the year, to \$7,485,976 from \$5,986,030 in 1938. The exports of engine lathes declined slightly, to \$6,532,765 from \$6,649,907. Other type lathes were exported during the year to the value of \$3,399,288, a 57 per cent advance over the corresponding shipments in 1938 valued at \$2,171,537.

More Boring Mills Sold

Exports of vertical boring mills and chucking machines advanced by 45 per cent in 1939, to \$5,248,354 from \$3,628,106 in the preceding year. Thread cutting and automatic screw machine shipments were up 27 per cent for the year, \$5,604,647 compared with \$4,408,770. Total shipments of knee and column type milling machines amounted to \$6,688,770, 44 per cent above the 1938 figure of \$4,629,144. The exports of all other types of milling machines totaled \$12,563,448, a 26 per cent gain over the 1938 trade valued at \$9,955,304.

Other items in which substantial increases were recorded during 1939 over 1938 included: Gear cutters, \$3,988,148 against \$3,106,344; vertical drilling machines, \$1,372,190—\$997,907; radial drilling machines, \$997,377—\$872,184; planers and shapers, \$4,020,389—\$2,794,302; internal grinders, \$4,338,865—\$4,000,109; tool, cutter, and universal grinding machines, \$3,887,041—\$3,268,048; other grinding machines, \$11,883,399—\$10,278,571; forging machinery, \$4,749,847—\$3,966,814; chucks for machine tools, \$331,238—\$300,878; milling cutters, etc., \$804,467—\$627,972.

Exports of rolling mill machinery dropped off slightly in 1939 to \$10,010,608 from \$10,057,889 in 1938, while a sharper loss was recorded in foundry and molding equipment, \$1,222,721 against \$1,948,697.

Denmark Tightens Imports

WASHINGTON—A cablegram to the Commerce Department reports that Denmark has extended import license requirements to cover the importation of saws, saw blades, files, and certain other hand tools. Denmark now requires import permits for practically all imports, the report said.



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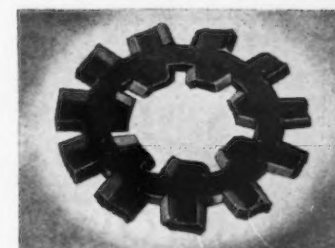
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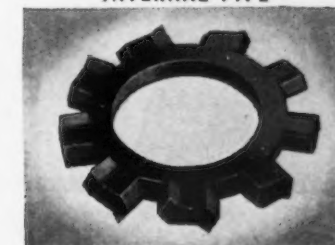
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Bill Curbing New Deal Agencies Held Up By Majority Leader

WASHINGTON—Tactics of administration leaders in Congress have somewhat dampened the hope of the Logan-Walter bill supporters that they can get legislative action at the present session to provide uniform administrative procedure of executive agencies. While a rule on the bill has been granted by the House, its proponents have been unable to bring it to the floor. Unfailingly it has been pushed aside in favor of other measures and Majority Leader Rayburn, in reply to a question by Representative Bruce Barton, Republican of New York, has said that no time has been fixed for consideration of the measure. Mr. Barton pointed out that he was receiving a great many letters from constituents asking about the status of the bill and inquired of the majority leader whether the bill is to come before the House for discussion and action at the present session.

"There has been no specific program

made out as yet," Mr. Rayburn said, after explaining that no time has been fixed for consideration of the bill. "What we want to do is to pass the appropriation bills as fast as they come to the House and intersperse with that matters more or less controversial. As far as general legislation is concerned, there has been no program made."

Mr. Rayburn replied in the negative when Mr. Barton asked whether it would be fair to "say that there is no plan for legislation except appropriation bills at this session of Congress."

Administration Hostile

The administration is strongly hostile to the bill because of fear of the curb it would put on its multiplicity of executive agencies, together with a cut in the size of their enormous personnel. In connection with moves to delay consideration of the bill as long as possible, is the plea that Congress should await the full report of the

Department of Justice's Committee on administrative procedure which more than a year ago began a so-called study of the subject. The charge is commonly made that the committee was set up to block the Logan-Walter bill, which once got through the Senate when Senate Majority Leader Barkley was caught napping. Due, however, to the alertness of his zealous 100 per cent New Deal aide, Senator Minton of Indiana, the Senate adopted a motion to reconsider the vote. The mental agility of the Indiana Senator had the effect of nullifying legislative action on the bill.

The Department of Justice Committee's report was well timed. It was given out while the House Rules Committee had the Walter-Logan measure before it. Despite the Department's committee suggestion that action on the bill be withheld until studies of the governmental agencies—130 of them—were completed the House Committee a few days later reported out a rule.

Holds Bill "Too Rigid"

The administration claims to favor the suggestion for greater uniformity in administrative procedure but insists that the Walter-Logan bill is too rigid. It is contended that it is impractical to apply identical procedure to all agencies and that to do so would greatly delay administration of laws. Such an outstanding organization as the Brookings Institution joins in the view, while it is combated by such a prominent organization as the American Bar Association, chief sponsor of the legislation. But in either case, supporters of the bill maintain that the legislation has been under consideration for many years and that there is no excuse for further delay of legislative action, whatever modification of the bill may be required.

That the executive agencies have need of reform is clear from the fact that some of those studied by the Department of Justice Committee have changed their procedure to a limited degree on the strength of the committee's recommendations. But supporters of the Walter-Logan bill consider that only the surface has been scratched. They point out that even if widespread and desirable changes in procedure had been made the changes would be voluntary. They want it procedural practice required specifically by law in order to bar return to undesirable procedure. They agree with the report of the House Judiciary Committee that "The law must provide that the governors shall be governed and the regulators shall




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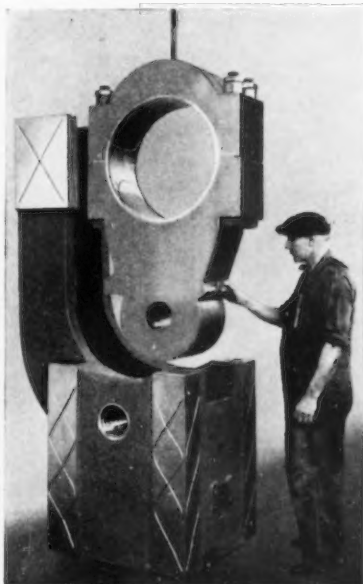
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Write for Bulletin No. 75.



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be regulated, if our present form of government is to endure."

Representative Walter, Democrat of Pennsylvania, co-author of the bill, and Senator King, Democrat of Utah, are pressing for early action on the measure but blocking moves by administration leaders now lead to concern by supporters lest it be pushed aside until it is too late to get a vote in both branches, if in either branch, of Congress during the present session. Many proponents of the bill at present are said to feel that because of the House rule granted, the bill should first be brought before the House and they claim once on the floor it would easily pass. On the other hand some supporters of the measure think the House should await action on amendments to the Wagner Act proposed by the Smith special House Committee. Mr. Walter does not share this view, feeling that if this strategy were

adopted there would be such a delay that it would prevent action at the present session.

In the Senate, too, it is believed that the bill could be passed, but probably by a narrow margin, perhaps so thin that the bill could be killed by veto, should the President turn thumbs down on the legislation, which, it is said, is probable.

Senator Hatch, Democrat of New Mexico, is fighting as hard for the Walter-Logan bill as he fought for his "clean politics" law, and the women lawyers of America have also joined the battle for the legislation.

Both Senator Hatch and Miss Adele I. Springer, Chairman of the Committee on Administrative Law of the National Association of Women Lawyers, said that the Walter-Logan bill is not directed against any administration, board or commission.

Brown & Sharpe Graduates Hold Large Reunion

MORE than 425 apprentice graduates of the Brown & Sharpe Mfg. Co. gathered for a reunion dinner, March 2, at the Biltmore Hotel, Providence, R. I. They came from 10 states and from Canada.

Henry Buker, Brown & Sharpe vice-president and a '95 apprentice graduate was toastmaster, and speakers included another prominent graduate, Clayton R. Burt, president, Pratt & Whitney division, Niles-Bement-Pond Co., West Hartford, Conn. In referring to this notable apprentice train-

ing school, Mr. Burt pointed out that many of the graduates are now filling responsible positions in industry throughout the country. "No matter where you go, you find them, making good use of the solid foundation of training they obtained here," he said.

Slides and motion pictures demonstrating the stoboscope and the high speed camera were shown by Prof. Harold E. Edgerton, Massachusetts Institute of Technology. Charles R. Northrup, an apprentice graduate in 1884, introduced Frank Lord, who completed his apprenticeship in 1882. J. E. Goff, supervisor of the apprentice department, welcomed the former



PROMINENT Brown & Sharpe Apprentice graduates at recent reunion dinner in Providence.

From left to right they are: Frank H. Lord, retired, who completed his apprenticeship in 1882; Charles R. Northrup, Syracuse, who was graduated in 1884; Clayton R. Burt, president, Pratt & Whitney division, Niles-Bement-Pond Co., and Henry Buker, Brown & Sharpe vice-president. Mr. Burt was graduated in 1896 and Mr. Buker in 1895. (Photo courtesy of Providence Journal Co.)

apprentices attending the dinner, the committee arranging which was headed by Neil B. MacLaren, foreman, Brown & Sharpe experimental department, and an apprentice graduate of 1921.

A new list of Brown & Sharpe apprentice graduates in the form of a 48-page booklet has been compiled by the company, replacing and bringing up to date the original booklet issued in 1937. Copies can be obtained from the company.

4th 1000-Ton Blast Furnace For Republic Steel

CLEVELAND—Under Republic Steel Corp.'s current blast furnace rebuilding program, announced by C. M. White, vice-president in charge of operations, No. 1 stack at Cleveland will be 105 ft. high, with an increase in the hearth diameter from 17 ft. to 25½ ft. Capacity will be increased from 550 tons to 1000 tons.

This is the fourth 1000-ton furnace for the corporation. The first was rebuilt in Cleveland somewhat over a year ago, the second in Youngstown and the third, the world's largest, was recently completed in Warren.

In Birmingham all of the steel work on one of the two furnaces at the Thomas plant is being rebuilt and the hearth is being increased from 16 ft. to 17 ft., which will increase capacity about 35,000 tons per year. New high uptakes are being installed to decrease flue dust production, increasing thereby the yield of the furnace. Work has already begun and will be completed in about 60 days.

Precipitron Units Installed at Weirton

PITTSBURGH—What is claimed to be the first steel mill installation of electrostatic air-cleaning apparatus for purifying ventilating air for main drives and motor-generator sets is now being completed at the Weirton Steel Co. plant, Weirton, W. Va., subsidiary of National Steel Corp.

It is said this marks the first time this new method of cleaning air has been used to protect electrical machinery from carbon, copper, and other dusts that are difficult to remove with mechanical filters.

The Weirton installation consists of two Westinghouse precipitron units, each rated at 72,000 cu. ft. a min. One unit is rated at 45,000 cu. ft. a min.

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Dominion Demand for Steel Climbs; Plates Bought in U.S.

TORONTO—Demand for finished and semi-finished steel materials continues to expand in the Canadian markets, with large orders going to mills from makers of war materials, aircraft and shipbuilders. Heavy purchases of plates have been the feature of the market, the greater part of this business going to the United States due to the fact that Canadian production largely is being absorbed for rolling stock, tank and boiler manufacture and is contracted for several months into the future.

Delay in obtaining delivery has held up temporarily Canada's extensive shipbuilding program, although announcement was made by two or three firms during the week that steel has started to arrive. Construction on the orders involving upwards of \$45,000,000 for anti-submarine and mine sweeper craft will thus be started immediately. Sheets also have been in good demand and local steel interests state that Canadian production has

been contracted for to the end of June, with some orders running into the third quarter. No sheets are available for delivery against spot orders except in small lots from warehouse operators. Large orders placed recently by the War Supply Board has stimulated demand for billets and various other steel materials. While no price changes have been announced, local steel interests state that regarding sheets current prices are firm and quoted to the end of this month, but beyond that date prices are to be made known at time of delivery.

Canadian War Contracts

War contracts placed by the War Supply Board during the week were valued at \$2,736,633. The most important awards include machinery which were placed as follows: Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., \$243,100; E. B. Bliss & Co., Ltd., Toronto, \$173,087; John Robertson Co., Brooklyn, N. Y.,

\$22,668; Ferracute Machine Co., Bridgeton, N. J., \$24,962; Williams and Wilson, Ltd., Montreal, \$17,988, and the A. R. Williams Machinery Co., Ltd., Toronto, \$7,253. Orders for aircraft supplies went to Engineering Products of Canada, Ltd., Montreal, at \$51,794; British Air Ministry at \$12,552, and Aviation Electric, Ltd., Montreal, \$6,342. Mechanical transport contracts were placed with Ford Motor Co. of Canada, Ltd., Windsor, Ont., at \$167,575; Kelsey Wheel Co., Windsor, \$131,417. Barracks stores went to Woods Mfg. Co., Ltd., Ottawa, at \$169,533; S. S. Holden, Ltd., Ottawa, at \$166,986; J. J. Turner & Sons, Ltd., Peterboro, Ont., at \$46,444. Munitions orders ranging in value from \$8,000 to \$21,000 each were placed with J. E. Lorrie Co., Ltd., Montreal, British War Office, Canadian Marconi Co., Montreal, and H. W. Cooley Machine & Arms Co., Ltd., Cobourg, Ont.

Munitions Orders Reported

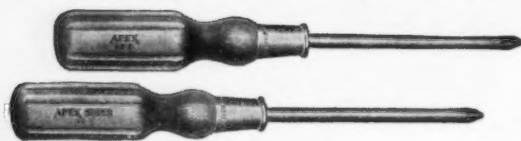
A number of important contracts for war materials are reported to have been concluded between the British Government and Canadian companies, although official confirmation is not yet at hand from the British officials. One of the most important of these British orders is said to be a large munitions contract placed with Canadian Industries, Ltd., and will be handled at the company's plant at Nobel, Ont., which plant will be enlarged to take care of the contract. Canadian Car & Foundry Co., Montreal, is said to have received a substantial British contract to manufacture large-sized shells. This order is said to be of an educational nature and on its successful completion other big contracts will be forthcoming. Dominion Foundries & Steel, Hamilton, is another company reported to have closed a British contract for manufacture of anti-aircraft gun barrels, and already has started work on an addition to its plant to handle this new business.

The St. John Dry Dock & Shipbuilding Co., Ltd., St. John, New Brunswick, has received a contract for construction of three anti-submarine boats at a cost of \$1,900,000. Work on the boats will be started immediately and all must be completed by November, 1941.

Officials of Canada Steamship Lines announce that the Midland shipyards at Midland, Ont., have been sold to the Kingston Shipbuilding Co., Kingston, Ont. The yards, where some of the largest Great Lakes vessels were built, have been idle since 1927, and it is understood that they will be re-

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opened for construction of mine-sweepers and other ships for which the Kingston company recently received contracts.

In addition to the general stimulus given to business in the Canadian iron and steel industry due to war orders, ordinary demand for steel also is showing improvement and large orders are in prospect. Structural steel and reinforcing steel sales are running to better volume than for several years past and prospective contracts run to several thousands of tons.

Construction program announced by the Bell Telephone Co. of Canada for the current year will involve an expenditure of \$14,947,000. The program, which covers new construction and replacements, is about \$100,000 more than expended in 1939. In announcing its construction plans, the company states that, as usual, the largest part of the program is accounted for by requirements in station equipment and exchange lines, which will total about \$10,000,000.

The Saskatchewan Local Government Board, Saskatoon, Sask., has approved a 20-year exclusive franchise for the Northern Natural Gas Co.,

to build a 162-mile pipe line involving outlay of \$5,000,000. The franchise will be voted on about April 1.

Steel Output at New High

Building trades in practically all parts of Canada are showing increased activity and consequently demand for building steel is advancing. In the reinforcing steel market, prospective orders include 600 tons for store building on East Hastings Street, Vancouver, B. C., for Forsts, Ltd.; 1000 tons for addition to Postal Terminal building at Montreal, for Dominion Department of Public Works, Ottawa; 1000 tons for addition to Ontario Hydro Electric building, University Avenue, Toronto, Anglin-Norcross, Ltd., general contractor; 200 tons for addition to Mont Ste. Anne convent at Lachine, Que.; 500 tons for apartment buildings at Vancouver, B. C., for E. M. Craig & Co., Ltd. Steel Co. of Canada, Ltd., Hamilton, Ont., has an order for 200 tons of reinforcing steel for a warehouse addition at Toronto for Canada Steamship Lines, Ltd.

January production of both iron and steel rose to record-breaking figures for Canada, passing the previous

record made in 1918. In January pig iron production totaled 104,703 long tons compared with 94,620 tons in December, and compares with the monthly average of 89,000 tons made in 1918.

Output of steel ingots and castings in January total 166,496 long tons against 150,062 tons in December and compares with the previous high monthly record of 164,388 long tons made in October, 1918.

Production of ferroalloys at 8065 tons in January is down from the 10,494 tons reported for December last.

NAM Sponsors Industrial Meeting at Pittsburgh

PITTSBURGH — With industrial representatives from Pennsylvania, Ohio, and West Virginia, the second of a series of regional meetings under the direction of the National Association of Manufacturers was to be held here March 14. William P. Witherow, president, Blaw-Knox Co., was chairman of the meeting.

H. W. Prentis, Jr., president, NAM and of Armstrong Cork Co., and Walter B. Weisenberger, executive vice-president of the NAM, were to address the dinner session which included a discussion of the business outlook by M. S. Rukeyser, economic news commentator. The afternoon session was to be devoted to an open forum on employment, employee relations, and associated subjects.

The sponsoring committee for the "leadership conference" included E. T. Weir, chairman, National Steel Corp., George A. Blackmore, president, Westinghouse Air Brake Co.; W. W. Holloway, president, Wheeling Steel Corp., and Mr. Weisenberger.

Protest Threatened on Car Wheel Bidding

DETROIT—Receipt of identical bids for the last seven years from seven car-wheel manufacturers will be protested to the United States district attorney if bidders continue the practice, according to W. H. Brieden, purchasing agent of the Detroit Street Railway system. The municipally owned transport system is in the market for 1000 wheels. The DSR also has been authorized to purchase approximately \$120,000 worth of rails and ties.



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Bridgeport Tool Exhibition Draws Large Attendance

ATTRACTIVE displays and a large attendance featured the four-day Industrial Tool and Equipment Exhibition held at the State Armory, Bridgeport, Conn., March 6-9, under the sponsorship of the Bridgeport Tool Engineers Association, Inc. Products of more than

153 companies were shown in 128 exhibit spaces, and floor space occupied by the exhibitors totaled more than 15,000 sq. ft. Two technical sessions, a banquet, and a number of plant visits were held in connection with the exhibition.

Although largely from New Eng-

land and neighboring industrial communities, the visitors included many from other sections. The exhibition was formally opened by Gov. Raymond E. Baldwin, of Connecticut. Earlier in the day, the exhibitors were welcomed officially by Mayor Jasper McLevy, of Bridgeport.

A wide variety of equipment, supplies and accessories, including many units exhibited for the first time, were shown, and operating exhibits were numerous. Predominating were the exhibits of small tools and cutters, tool materials, gages and measuring instruments and devices. Small tools included drills, reamers, counterbores, countersinks, milling cutters of all types, ground thread taps, dies, boring tools, gear and spline hobs, abrasives, metal cutting saws, files, single point tools, tool bits, and tool holders, chrome-plated dies and tools, and instructive displays of cemented carbide and stellite tools and accessories.

Gages and measuring devices included optical devices, contour measuring projectors, chrome-plated units, dial gages of recent development, and an interesting showing of gage blocks and accessories. Hardness testers and a variety of indicating and recording instruments were also shown.

There were several exhibits of heat-treating equipment, and also of industrial lift trucks, cranes, hoists, portable elevators and other materials handling devices. Lubricating, filtering, and degreasing devices, cleaning compounds, cutting oils and lubricants, metal-spraying equipment and welding and gas cutting machines were also shown.

Machine tools included tool and cutter and other grinders, turret and other milling machines, sawing and die filing machines, and jig borers. A new automatic screw driving machine was demonstrated and riveting machines, and punch presses were shown. There were several exhibits of motors and other electric equipment, bearings, and of chains, sprockets, belting, pulleys, sheaves, hangers, couplings, gears and other transmission devices.

Technical Sessions and Plant Visits

Papers at the first technical session included "Cutting Fluids and Lubrication," by William M. Duncan, chief chemist, Stuart Oil Co., Chicago, and "Superfinishing," by George H. Denison, sales engineer, Carborundum Co., Detroit. At the second session H. G. Johnstin, Vanadium Alloys Steel Co., Latrobe, Pa., spoke on "Recent Developments in High-Speed Steel," and J. A. Comstock, consulting metallurgist, Surface Combustion Co.,

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CUPRODINE is simply added to the sulphuric acid solution. The coating time is measured in seconds, and the process is also economical of labor and materials.

CUPRODINE is made by the manufacturers of RODINE, a standard inhibitor wherever steel is pickled. Write for particulars on either or both of these products.



AMERICAN CHEMICAL PAINT CO.

Box 309, AMBLER, PENNA.

Detroit, Michigan

Walkerville, Ont.

Toledo, Ohio, on "Atmospheres for Hardening Steel."

A. V. Bodine, president, Bodine Corp., Bridgeport, was toastmaster at the banquet on the evening of March 7, and Commander E. R. Henning, United States Navy, spoke on the subject of "Industrial Mobilization." Addresses were also made by E. Kent Hubbard, president, Manufacturers' Association of Connecticut and George E. Hawley, president, Bridgeport Manufacturers' Association. The banquet and the technical sessions were held at the Stratfield Hotel.

Plants open for inspection included that of the Aluminum Co. of America, American Chain Co., Bassick Co., Bridgeport Brass Co., Bryant Electric Co., Bullard Co., General Electric Co., and the Stanley Works.

Census Interpreted For Steel Makers

WASHINGTON—Reports from iron and steel manufacturers on their 1939 operations are being received by the United States Census Bureau at an encouragingly rapid rate, according to Thomas J. Fitzgerald, Chief Statistician for Manufactures.

"However," Mr. Fitzgerald stated, "the returns indicate some misunderstanding as to the manner in which cost of coke is to be reported. This is to be listed under the classification 'cost of fuel' and not as 'cost of materials.'"

"Care should also be taken to report the total cost of all fuels, including purchased steam, wood, gas, etc.

"It is also important not to overlook the query on what were the principal materials used. The answers to this, when tabulated, will provide important market information.

"In listing 'all other employees' in addition to those falling in the classifications of salaried officers, manufacturing, distribution or construction employees," he continued, "the type of work they performed should be stated. Clerks in factories, unless they devote the major portion of their time to sales or distribution activities, should be reported as manufacturing employees.

"Whenever there is any doubt as to how a question should be answered, manufacturers who are making out their own returns should be sure to consult the booklet of instructions furnished them by the enumerators. If this does not provide an answer, the district supervisor of the census should be called.

"Attention to these points will eliminate the necessity for follow-up correspondence, and thus help us publish statistics on the iron and steel industry at an earlier date."

Total number of returns received from all types of manufacturers by the end of February was 27,585, Mr. Fitzgerald reported. This compares with 22,658 at the same time two years earlier. Four years ago only 15,042 schedules had been received by the end of February.

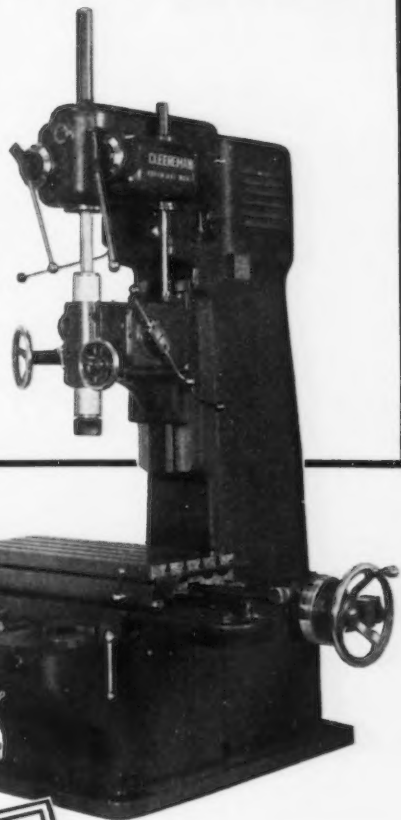
New Square D Plant

CONTRACTS for design and construction of a new plant and office building 238 x 430 ft. for the Square D Co., Milwaukee, have been awarded to the Austin Co., Cleveland engineers and builders. The building will be located on North Richards Street. It will be of monitor construction with welded steel trusses and will have two 60-ft. aisles and three 40-ft. aisles.

ACCURACY *plus* RANGE OF WORK!

CLEEREMAN Jig Borers not only are designed and built for extreme accuracy but they offer the additional advantage of being made in three sizes with table travel of

18" x 24", 18" x 30",
and 18" x 36"



Buy a
CLEEREMAN
Jig Borer
to secure ample
capacity

Address
Bryant Machinery & Engineering Company
400 W. Madison St., Chicago, Ill., U. S. A.
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Cleereman Machine Tool Company
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DRILLING MACHINES and JIG BORERS

Industry Awaits Action on Bill Clipping Powers of U.S. Boards

INDUSTRY this week looked to Washington for early action on the Logan-Walter bill, a measure designed to check "Administration law" and limit power of New Deal boards to act simultaneously as legislative, executive and judicial agencies.

The bill, first genuine attempt to

curb mushroom growth of Government agencies, strikes at three evils characterizing all bureaucratic operation, N. W. Pickering, president, Farrel-Birmingham Co., and A. W. Rucker, declare. These evils are:

1—Delay in issuance of regulations under which a given law will be ad-

ministered, with consequent uncertainty so hampering to enterprise, and regulations issued without notice.

2—Arbitrary decisions contrary to evidence and reason.

3—Restriction of the right of court appeal, especially as regards findings of fact, by aggrieved parties.

The "jimmy" in the Wagner, Railway Labor and other acts which opens the door to almost unrestricted exercise of individual judgment and opinion by members and employees of Government boards is inclusion of the provision: "The board shall have authority to make, amend and rescind such rules and regulations as may be necessary to carry out provisions of this act."

"The Logan-Walter bill is a somewhat belated recognition by Congress that the American system is rapidly on its way to individual dictatorship on the installment plan through repeated grants of power to administrative agencies in one field after another," the two writers of a study recently published by the Farrel-Birmingham Co. say.

Summarized, the legislation provides for prompt issuance of rules by agencies created by Federal statute, for notice and public hearing, for appeal without delay incident to presentation of a case in point, and for judicial review of decisions of all boards, commissions, administrators and Federal agencies both as to findings of fact as well as law.

Messrs. Pickering and Rucker note that mass economic freedom is confused with mass control of economic processes, especially those concerning economic freedom of others. "Contrary to the apparent conviction of many reformers," they write, "mass economic freedom does not mean license to harass successful enterprise, to interrupt production, to fix prices and cost, to dictate management policy and subvert management control."

DOUBLE ACTION



With Wyandotte and Wyandotte Service

When you have a metal cleaning job on hand, you want *action!* You want to keep the work moving through your hands to the finishing operations with no delays and no rejects.

And that's why Wyandotte offers *double action*—to help you keep your production line moving on schedule.

ACTION #1—Wyandotte Metal Cleaners — for routine, established cleaning jobs—a full line, ready to save you time and money.

ACTION #2—Wyandotte Service Men—trained metal cleaning experts, ready to work with you to find the *right* metal cleaner for any job you have. No job is too big, no job is too small—there's a Wyandotte man always on call!



Foster Company Organized

HAROLD M. FOSTER is president of a newly organized concern, Foster Steel Treating Co., with plant and office at 220-222 Clifford Street, Newark, N. J. The company is equipped with new heat treating furnaces and will enter the field of commercial heat treating in all of its forms, beginning operations about March 15. Mr. Foster for the past 10 years has been manager of tool and alloy steel sales for Faitoute Iron & Steel Co., Newark.

Nazis Halt German Technical Progress, U.S. Engineers Say

PROPAGANDIZED "scientific" reports and a decline of scholastic standards are halting technical progress in Germany, two University of Texas engineers asserted this week in a statement that the Reich and other central European countries are being drained of engineers through army enlistments.

Supposedly scientific journals from Germany are tainted with propaganda and false claims, particularly in the field of mechanical and chemical engineering, that American scientists know to be unreliable, W. R. Woolrich, dean of engineering, says. He pointed to instances of reports of German discoveries that are "chemical impossibilities."

This tendency is laid by Dr. E. M. Siegel, of the Texas school, to "the Nazi idea that it is not necessary to learn anything, and that things can be done by brute force. Hitler's disdain for mathematics, physics and other technical subjects is reflected in a decline of students in German technical schools from 40,000 to 13,000 today.

Although the Nazis, who have slowed down Germany's once outstanding technical progress, need 10,000 engineers yearly for their industrial program, only 2300 can possibly be graduating each year from the six-year technical school courses, Dr. Siegel said.

15,000 on Douglas Aircraft Payroll, Company Hires More

SANTA MONICA, Cal. — With more than 15,000 employees on the pay roll, Douglas Aircraft Co. is still hiring machinists, tool makers, pattern makers, riveters and other skilled mechanics, according to W. G. Jerrems, personnel manager. The company may have 17,000 persons in its employ by mid-summer.

Steel Credit Men to Meet at Toronto, May 19-23

CREDIT executives of the iron and steel industry will gather at the Royal York Hotel in Toronto, Can., May 19-23, attending the 45th annual Credit Congress. This is the first international congress to be held by the National Association of Credit Men, One Park Avenue, New York, and the

Canadian Credit Men's Trust Association, Ltd., 137 Wellington, W., Toronto, Canada.

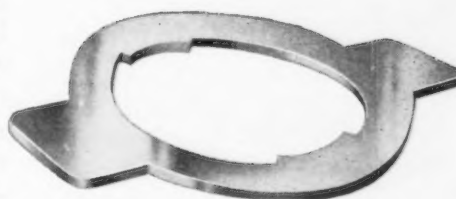
The committee in charge of the Steel Industry program and meetings is composed of W. E. Woollenweber, Wheeling Steel Corp., Wheeling, W. Va., chairman; J. L. Brayley, Samuel

Son & Co. Ltd., Toronto, vice-chairman; S. C. Brennon, Paper Calmenson & Co. Inc., St. Paul, Minn., vice-chairman; O. B. Tearney, Inland Steel Co., Chicago; C. T. Siebert, Jr., Carnegie-Illinois Steel Corp., Pittsburgh, Pa., and J. H. Early, Truscon Steel Co., San Francisco, Cal.

American Nickeloid Co., Peru, Ill., announces the establishment of an export office at 201 North Wells Street, Chicago. Sales representatives are being established in all principal countries abroad.

DoAll SAVED 22½ HOURS

Northwest Airlines, Inc., of St. Paul, Minn., made this special Wrench from chromally steel in 80 minutes on the DoAll, 40 minutes for sawing, 40 minutes for filing. Outside dimensions are 24" long, 18" wide. Former time was 24 hours burning, milling, shaping and sanding.



STARTLING RESULTS

Contour Sawing, the new DoAll process of machining, is recognized as the fastest precision method of removing metal; cuts out internal and external shapes from any metal up to 10" thick.

Does work of 3 machines. DoAll is a moderately priced, rugged, precision machine tool that replaces shaping, milling and lathe work on a large variety of jobs with enormous savings.

Used in large and small plants in 30 countries by such firms as General Electric, Ford, Douglas Aircraft, Foster Machine, C.M. St.P. & P. R.R., Radio Condensor, Corey Steel, Baldwin Locomotive, Ferro Stamping, Underwood Elliott Fisher, etc.



Let a factory trained man bring a DoAll to your plant and show you what it does, what it saves on your own work.

FREE — New Handbook on Contour Machining — 158 pages of valuable metal working helps.

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ADDRESS

THE IRON AGE, March 14, 1940—71

Government Orders

WASHINGTON — Government contracts for iron and steel products, as reported for the week ended March 2 by the Labor Department's Public Contracts Division, totaled \$843,812. Contracts reported for the same period for non-ferrous metals and alloys aggregated \$215,151; and for machinery, \$366,676. Details follow:

Iron and Steel Products

United States Pipe & Foundry Co., Philadelphia, D. C. Govt., cat iron pipe	\$34,736
Bethlehem Steel Co., San Francisco, Interior Recl., reinforcement bars ..	167,132
Hardie-Tynes Mfg. Co., Birmingham, Ala., Panama Canal, jack bases ..	119,000
Truscon Steel Co., New York City, WPA, reinforcement bars	48,058
United States Pipe & Foundry Co., New York City, War QMC, cast iron pipe	34,720
United States Pipe & Foundry Co., Phila., Indian Head Yard, pipe & pipe fittings	18,415

Non-Ferrous Metals and Alloys

The American Brass Co., Waterbury, Conn., Puget Sound Navy Yard, pipe & tubing	\$38,879
Caswell, Strauss & Co., Inc., New York City, Navy S&A, pig tin	95,792
Kennecott Sales Corp., New York City, Navy S&A, ingot copper	11,530
Kennecott Sales Corp., New York City, Navy S&A, ingot copper	57,650
Northwest Lead Co., Seattle, Panama Canal, pig lead	11,300

Machinery

Ingersoll-Rand Co., Denver, Interior Recl., air compressor	\$13,950
Wm. Sellers & Co., Inc., Philadelphia, Navy S&A, radial drills	95,300
The Bullard Co., Bridgeport, Conn., Navy S&A, boring machines	11,823
William Sellers & Co., Inc., Philadelphia, Navy S&A, planer	47,900
The Sidney Machine Tool Co., Sidney, Ohio, Navy S&A, engine lathes ..	12,836
South Bend Lathe Works, South Bend, Ind., Navy S&A, engine lathes ..	72,575
Link-Belt Speeder Corp., Chicago, Navy Marine Corps, power shovel ..	10,115
Edison General Electric Appliance Co., Inc., Chicago, Procurement, refrigerators	Indefinite
Servel Inc., Evansville, Ind., Procurement, refrigerators	Indefinite
Westinghouse Electric & Mfg. Co., Procurement, refrigerators	Indefinite
The Austin-Western Road Machinery Co., Aurora, Ill., WPA, grader	10,095
The Bodine Corp., Bridgeport, Conn., War Ordnance, drilling machines ..	11,925
Clayton Mfg. Co., Alhambra, Cal., War Air Corps, cleaner	12,000
Bedford Foundry & Machine Co., Bedford, Ind., War Engineer Corps, river wall valves	18,666
The General Excavator Co., Marion, Ohio, War Engineer Corps, excavator	21,635
Mobile Stove & Pulley Mfg. Co., Mobile, Ala., War Engineer Corps, joints, gaskets	14,520
The Lodge & Shipley Machine Tool Co., Cincinnati, War Ordnance, engine lathes	13,334
Barnard Aviation Equipment Co., Inc., Newark, N. J., Navy S&A, machine casting	14,153
Morris, Wheeler & Co., Inc., Philadelphia, Navy S&A, sheet steel	32,726
Allegheny Ludlum Steel Corp., Water-vliet, N. Y., Navy S&A, tool steel ..	11,344
John A. Roebling's Sons Co., Trenton, N. J., Navy S&A, wire cloth	15,174
Bethlehem Steel Co., Bethlehem, Pa., Navy S&A, steel	27,889
Carnegie-Illinois Steel Corp., Pittsburgh, Navy S&A, bar steel	11,247
Central Iron & Steel Co., Harrisburg, Pa., Navy S&A, steel plates	76,429
Joseph T. Ryerson & Son, Inc., Chicago, Navy S&A, structural steel ..	11,760

Pheoll Mfg. Co., Chicago, Navy S&A, screws, nuts	16,728
Seovill Mfg. Co., Waterbury, Conn., Navy S&A, screws, machine	18,744
Reed & Prince Mfg. Co., Worcester, Mass., Navy S&A, wood screws ..	27,064
Yale & Towne Mfg. Co., Stamford, Conn., Navy S&A, locks	14,864
Tubular Service Corp., Brooklyn, N. Y., Navy S&A, boiler tubes	12,473
Lukens Steel Co., Coatesville, Pa., Navy S&A, plate steel	10,651
Blaw-Knox Co., Pittsburgh, Navy S&A, king posts	26,292
The Anthony Carlin Co., Cleveland, Navy S&A, steel rivets	64,950
Bethlehem Steel Co., Bethlehem, Pa., Navy S&A, rivets	Indefinite
National Cast Iron Pipe, Kansas City, WPA, cast iron water pipe	11,515
C. J. Rainear & Co., Inc., Philadelphia, War QMC, plumbing fixtures ..	17,738

Navy Awards

WASHINGTON—Latest contracts to be announced by the Navy Department's Bureau of Supplies and Accounts were awarded to these companies:

American Tool Works Co., Cincinnati, engine lathe, \$36,677; Henry Prentiss & Co., Inc., New York City, vertical grinder, United States Gauge Co., New York City, check valves, \$8,000; The Upson-Walton Co., Cleveland, steel anchors, \$12,305; Walworth Co., New York, tube fittings, \$23,799; Stanley G. Flagg & Co., Inc., New York, tube fittings, \$9,449.

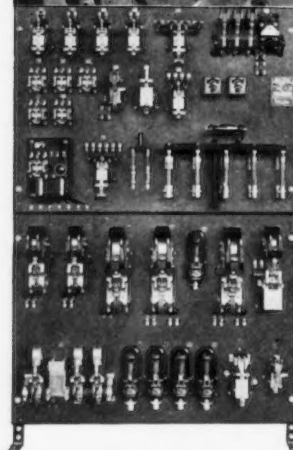
Lloyd & Arms, Inc., Philadelphia, honing and boring machine, \$10,948; Pacific Marine Supply Co., Seattle, portable

MACHINES by VAUGHN Control by EC&M

What has the Control
to do with
Easier Stripping!



Note the simplicity of
this EC&M Controller
for these Vaughn
MOTOBLOX. It is built
with LINE-ARC Con-
tactors and NEO-TIME
Acceleration!



HEAVY DUTY MOTOR CONTROL
FOR CRANES, MILL DRIVES AND
MACHINERY • BRAKES • LIMIT
STOPS • LIFTING MAGNETS AND
AUTOMATIC WELD TIMERS.

— Easier Stripping
DRAWING MACHINE Control

pumps, \$20,274; General Cable Corp., cable, \$11,294; National Electric Products Corp., Pittsburgh, cable, \$10,815; Monarch Machine Tool Co., Sidney, Ohio, engine lathe, \$6,352; United Aircraft Corp., Hamilton Standard Propellers Division, East Hartford, Conn., services and material for aircraft engine and conduct tests, \$211,017.

General Electric Co., Schenectady, triple cable, \$17,837; Sperry Gyroscope Co., Inc., Brooklyn, N. Y., automatic pilots, \$950,136; Gallmeyer & Livingston Co., Grand Rapids, Mich., grinding machines, \$5,654; Grumman Aircraft Engineering Corp., Bethpage, N. Y., spare aircraft parts, \$16,976; Machinery Sales Co., Los Angeles, milling machine, \$6,642; Baldt Anchor Chain & Forge Corp., Chester, Pa., anchor chain, \$172,500; Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn., vertical shaper, \$6,740.

Carnegie-Illinois Steel Corp., Pittsburgh, bar steel, \$5,279; Rockbestos Products Corp., New Haven, Conn., cable, \$18,425; Rivett Lathe & Grinder, Inc., Brighton, Mass., precision lathes, \$9,074; Henry Prentiss & Co., Inc., New York City, turret lathe, \$11,535; Gary Steel Products Corp., Norfolk, Va., steel barrels, \$20,839; The Edwards Mfg. Co., Cincinnati, practice bombs, \$79,166.

More Manganese Bids

WASHINGTON—The Treasury Department's Procurement Division last week received bids for 5000 tons of manganese ore from nine com-

panies, four of which offered to supply domestic ore. A \$180,000 contract for 5000 tons previously had been awarded the Greenbrier Mining Corp., White Sulphur Springs, W. Va., but the division readvertised for bids after the company failed to put up a performance bond. The Greenbrier Co. was organized under the presidency of Andrew J. May, chairman of the House Military Affairs Committee. Details on the latest manganese bids, all based on grade B ore, follow:

Luna Manganese Co., Jackson, Mich., New Mexican ore, estimated price for 5000 tons, \$149,280; Great Valley Manganese Co., Inc., Stuarts Draft, Va., Virginia ore, \$40,320 for 1000 tons; North American Manganese Corp., St. Louis, Arkansas ore, \$136,800; J. Y. G. Co., Wickenburg, Ariz., \$180,000.

William H. Muller & Co., Inc., New York, South African ore, \$146,952; Derivatives, Inc., and Tonerde, Inc., New York, South African and British Indian ore, \$156,480; Leonard J. Buck, Inc., Jersey City, N. J., Russian ore, \$160,369; Cuban-American Manganese Corp., New York, Cuban ore, \$165,000; L. W. Lambert, Upper Lake, Cal., grade B Philippine ore, \$156,000. Prices quoted on imported ore included duty.

Educational Orders

WASHINGTON—Latest awards to be made by the War Department under the Army's Educational Orders Program total \$381,802 and were made to these companies:

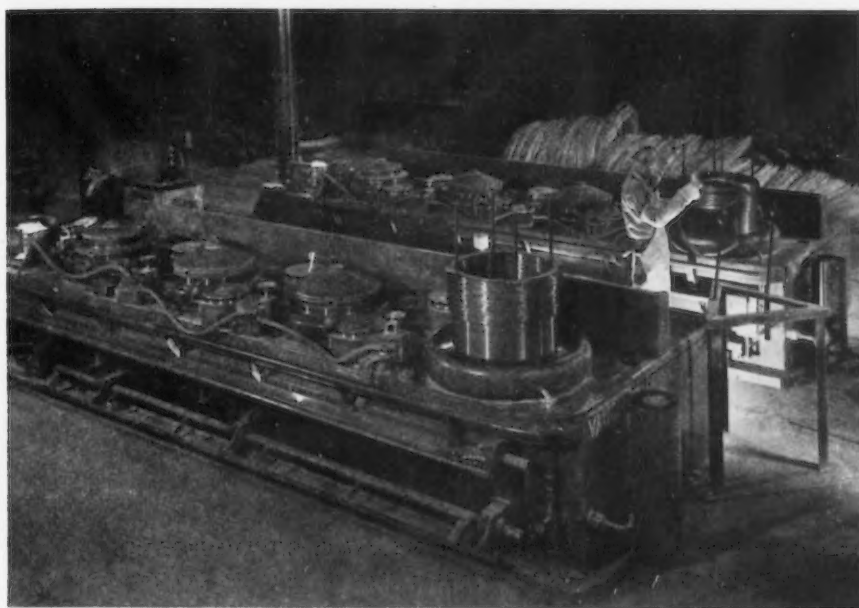
Scoville Mfg. Co., Waterbury, Conn., time and superquick fuse and related items, \$153,152; Mergenthaler Linotype Co., Brooklyn, N. Y., panoramic telescope and related items, \$99,245; Kellogg Switchboard & Supply Co., Chicago, \$36,938; Holtzer-Cabot Electric Co., Boston, \$43,482; Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y., \$48,984, all for telephone equipment and related items.

Labor Board Rulings

WASHINGTON—The National Labor Relations Board has:

Directed the Baldwin Locomotive Works, Eddystone, Pa., to disestablish Federation of Baldwin Employees as a collective bargaining agency of its employees and to reinstate with back pay five employees found to have been discriminated against because of their union activity. Dismissed the complaint in so far as it alleged the company had discriminated against 12 other employees either because they had testified or filed charges under the act, or because of their union activities. Board Member William M. Leiserson dissented in part to these dismissals.

WIRE-DRAWING..



THESE 4-HR Vaughn Wire-Drawing Machines, equipped with an adjustable speed motor for each spindle and operated by a simple method of control developed by EC&M, are giving excellent results in drawing high carbon wire.

Although the weight of the wire added to the last spindle increases the flywheel effect of the last motor-drive, EC&M has engineered a system of control which compensates for this condition automatically. The EC&M Full Magnetic Controller is designed to distribute the dynamic braking torque in proportion to the inertia of each spindle so that all spindles stop *uniformly* . . . under any condition of load.

And when ready to strip a coil, EC&M allows the last or gathering spindle to be backed up easily by hand, permitting slack in the wire when a finished coil is to be removed.

This unique method of control for wire-drawing machines gives superior operating results. Consult our nearby sales office for complete data.

**Smoother Starting and Stopping
with EC&M Engineered WIRE-**

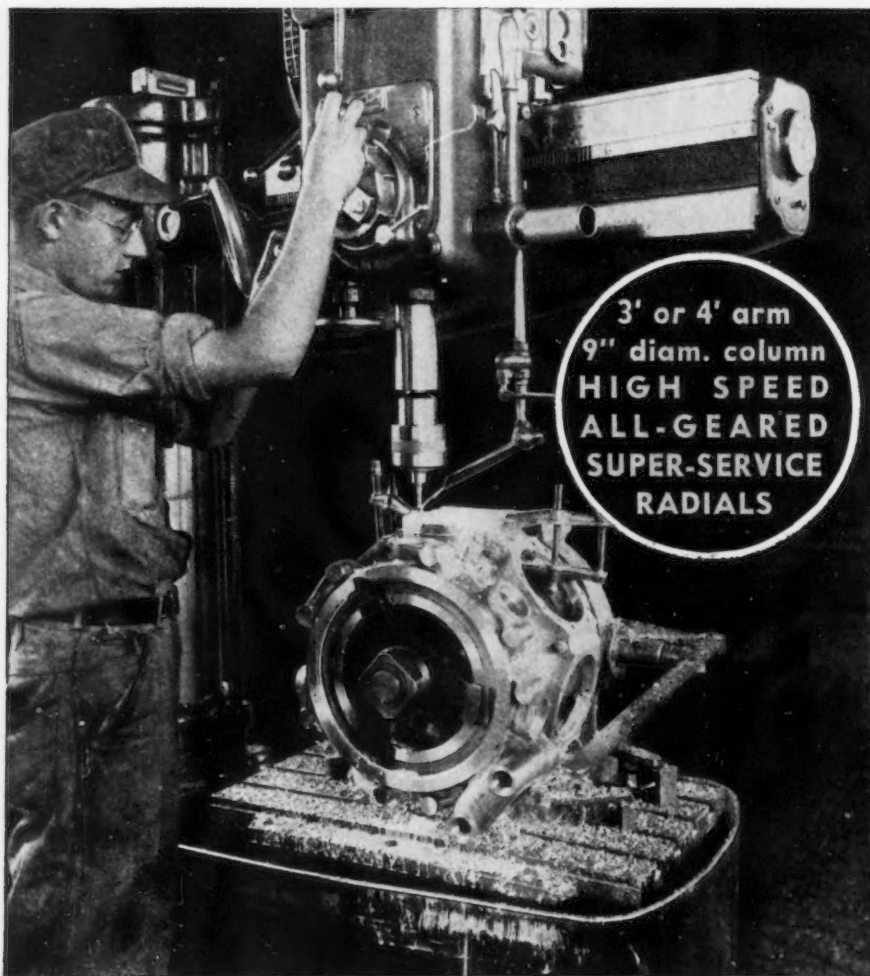
... PERSONALS ...

MORRIS EVANS LEEDS, chairman of the board of the Leeds & Northrup Co., Philadelphia, was one of the "Modern Pioneers" in the Philadelphia district selected recently by the Modern Pioneers Committee of the National Association of Manufacturers in observance of the 150th Anniversary of the founding of the American patent system.

JOSEPH A. SCHULTZ, who has been associated with the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., since 1938, has been appointed purchasing agent of the company's Mansfield, Ohio, works, succeeding J. E. LAUTSBAUGH, who has resigned. Mr. Schultz is a graduate of Northeastern University, Boston, in mechanical engineering.



M. E. LEEDS, one of the "Modern Pioneers" in the Philadelphia district.



3' or 4' arm
9" diam. column
HIGH SPEED
ALL-GEARED
SUPER-SERVICE
RADIALS

**Jacobs Aircraft Engine Co., Pottstown, Pa.
save 15% on this accurate work . . .**

Here's another example of the Super-Service Radial's ability to produce more work and better work at less cost.

Aeroplane parts such as the crank case shown here are drilled, bored tapped and faced to accurate tolerances of $\pm .001$ ".

For interchangeable manufacture and

the full efficiency of rapid production jigs, you need the convenience and finger-tip ease of handling which the High Speed Super-Service Radial provides.

Bulletin R-21A explains the distinctive high production features of this machine.

Write for your copy today.

THE CINCINNATI BICKFORD TOOL CO.
OAKLEY CINCINNATI OHIO U.S.A.

WILLIAM C. DICKERMAN, since 1929 president of the American Locomotive Co., New York, has been elected chairman of the board. DUNCAN W. FRASER, vice-president of the company since 1920, has been made president, and ROBERT B. MCCOLL, heretofore vice-president of the American Locomotive Co., Alco Products Division, has been appointed vice-president in charge of



JOSEPH A. SCHULTZ, new purchasing agent of the Mansfield works of Westinghouse Electric & Mfg. Co.

manufacturing of the American Locomotive Co.

Mr. Dickerman was born on Dec. 12, 1874, at Bethlehem, Pa. Following his graduation from Lehigh University in 1896, he entered the employ of the Milton Car Works, Milton, Pa. Three years later when the Milton Car



LOUIS C. EDGAR (above), assistant chief engineer, Carnegie-Illinois Steel Corp., Pittsburgh, and **Arthur V. Wiebel** (below), new chief engineer of the Pittsburgh district, Carnegie-Illinois Steel Corp., whose appointment was announced in these columns last week.



Works became a part of the American Car & Foundry Co., he was appointed assistant manager of the Milton district. He was transferred to New York in 1900 as sales agent and later was

made general sales agent. He was appointed vice-president in 1905 and vice-president in charge of all operations of the Car & Foundry company in 1919. He was elected president of the American Locomotive Co. in 1929.

Mr. Fraser served his apprenticeship at the Rhode Island Locomotive Works. In 1904, when the American Locomotive Co. acquired the Montreal Locomotive Works, Ltd., Mr. Fraser was transferred to the Montreal Works where he served in various capacities

until he became works manager, and later managing director of the company. He was appointed vice-president of the American Locomotive Co., with headquarters in New York in 1920. He became a director in 1924 and in 1939 was made a member of the executive committee of the company.

Mr. McColl was born in Scotland and served as a draftsman with Robert Stephenson & Sons, locomotive builders, of Darlington, England, until 1905, when he went to the Montreal

GET the hoist with every worthwhile feature

A-E-CO
LO-HED
Time-tested
HOISTS

THERE'S A LO-HED ELECTRIC HOIST FOR EVERY PURPOSE
A—Bolt Suspension Type.
B—Plain Trolley Type.
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D—Motor Driven Trolley Type.
E—Cab-Controlled Type.
CAPACITIES FROM 1/4 to 12 TONS

When you buy an electric hoist you want all the worthwhile features a hoist should have.

Here is the way to get them: specify LO-HED. Lo-Hed construction includes every feature that the test of time has proved desirable. A-E-CO engineers have successfully resisted every temptation to add gadgets which would only have provided mere "talking points" or "improvements" which would not better performance, life, efficiency, or maintenance. Note in the open-view of the

Lo-Hed Hoist the logical arrangement of the hook between the drum and motor for minimum head-

room. And these time-tested features: heavy duty hoist motor, automatic lowering brake, automatic bearings, stub shafts, grooved drum, plow-steel cable, 100% positive automatic stop, fire, dust and moisture-proof controller. (Construction varies slightly for classes of Lo-Heds). • Investigate Lo-Hed time-tested construction. Write today for the complete Lo-Hed Catalog, shown below.

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OTHER A-E-CO PRODUCTS: TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER.

Classified phone directories list the local A-E-CO representative in principal cities. Call him in . . . or write us for the hoist catalog.

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☐ Please send me your 26 page complete catalog of Lo-Hed Hoists.
☐ Ask your representative to call.
Name
Company
Street Address
City State
(Please print plainly)

Locomotive Works, Ltd., of which he later became assistant superintendent, then superintendent of works and finally works manager. During the World War he was manager of the munitions department of the Eddystone Munion Co. He became identified with the New York office of the American Locomotive Co. in 1922. Soon thereafter he was made assistant manager of the Schenectady plant and in January, 1925, manager of that plant. Six years later he was elected president

and director of the McIntosh & Seymour Corp., a division of the American Locomotive Co., and when that division was merged with the parent company, Mr. McColl was appointed vice-president of the Diesel Engine Division of the Locomotive company. He was elected president of Alco Products, Inc., in 1936 and when this was merged with the parent company, Mr. McColl was appointed vice-president of the American Locomotive Co., Alco Products Division.



JOHN L. SULLIVAN, general superintendent of H. C. Frick Coke Co. Details of his career appeared in these columns last week.



THIS DISC WILL NEVER BE USED

One of our Blu-Mol Molybdenum High Speed blade users amazed himself recently by keeping score of the performance of a particular blade. The result is shown above—a nice, clean steel disc that will never be fabricated because he passed it along to us and we've enshrined it in our collection of Blu-Mol immortals. After wolfing through 2332 sq. in. of tough stuff, this blade went right on to cut off this $4\frac{1}{8}$ " section in 3 minutes and 20 seconds. We're not surprised; this is remarkable only because it's recorded. Blu-Mol does that kind of thing all the time. We'd like to see any glib salesman try to wean this customer away from Blu-Mol. Have us arrange a trial of Blu-Mol on your own work; phone, wire, or write today—no obligation.

*Make us
prove this
statement*
"Blu - Mol
Molybdenum
Hack Saw
Blades provide the low-
est cost per
cut of any
blade on the
market."

MILLERS FALLS COMPANY
GREENFIELD, MASSACHUSETTS



WILLIAM H. RICHARDSON, heretofore general manager of the service-sales division of Timken Roller Bearing Co., Canton, Ohio, has been appointed assistant general sales manager of the company. He has been associated with the company for 23 years in various capacities, having served first as a salesman and later as branch manager, district manager, and as vice-president and general manager of the old Timken Roller Bearing Service & Sales Co.

E. H. AUSTIN, who will succeed Mr. Richardson as general manager of the service-sales division, has been with the company 21 years, having served as salesman, branch manager and assistant general manager of the division.



LOUIS KUEHN, who founded and was president of what is now the Milcor Steel Co., Milwaukee, Wis., until 1938, when he was made chairman of the board, has announced that he is retiring from the company as of April 1. He will continue to serve as a director of Inland Steel Co., which controls Milcor.

Succeeding him as chairman of the board will be **WILFRED SYKES**, assistant to the president of Inland Steel. **E. A. TANNER**, president, and all other Milcor officers continue. **E. L. LIPMAN**, secretary-treasurer, has been elected to the board of directors to fill the vacancy caused by Mr. Kuehn's retirement.

Mr. Kuehn came to this country

from Bischweiler, Alsace-Lorraine, 50 years ago, and has spent practically all of this time in the metal industry. His first job was with the Berger Mfg. Co., in Canton, Ohio, which he joined as a punch press operator, working his way up to a salesman's position. Later he went to LaCrosse, Wis., to enter the roofing business with three others. In 1902 he went to Milwaukee where with three friends, Fred and B. C. Pritzlaff and August Luedke, he organized the Milwaukee Corrugating Co., which during ensuing years opened branches in various cities throughout the country, and acquired other firms, including the Eller Mfg. Co., at Canton. About 1930 the firm's name was changed to Milcor Steel and was sold to Inland Steel Co. in 1936.

♦ ♦ ♦

FRANK E. GRAPER has been named president and general manager of Acklin Stamping Co., Toledo, Ohio, filling the vacancy caused by the death of W. Collard Acklin. F. CYRIL GREENHILL is vice-president and general sales manager and ALVIN E. SEEMAN, vice-president and treasurer. These three with HUBERT D. BENNETT and GEORGE MEDILL compose the directorate.

♦ ♦ ♦

S. G. LANGHER, formerly vice-president, Akron Brass Co., Wooster, Ohio, has been elected president at the suggestion of HERMAN FREEDLANDER, former president, who has been made vice-president.

♦ ♦ ♦

HARRY F. GRISCOM has been elected vice-president in charge of sales of the Ross-Meehan Foundries, Chattanooga, Tenn.

♦ ♦ ♦

CECIL MULLIGAN, for the past two years production manager for Vultee Aircraft Co., has been made factory manager of Lockheed Aircraft Corp., Burbank, Cal. He will be in charge of the manufacturing, tooling and production planning departments at the new Vega factory.

♦ ♦ ♦

JOSEPH S. THOMPSON, who has been identified with the Babcock & Wilcox Tube Co., Beaver Falls, Pa., since 1934, has been appointed district sales manager of the Chicago office. He was transferred to Chicago as a salesman in 1937.

♦ ♦ ♦

ROBERT S. CRAWFORD, formerly roll designer and roll engineer for Republic Steel Corp., Cleveland, has been made superintendent of rolls of the Timken Roller Bearing Co., Canton, Ohio. He will assist GENE BALL,

superintendent of rolling mills. He started his career in the steel industry in 1915 as an apprentice with the American Steel & Wire Co.

♦ ♦ ♦

JAMES L. MAHON, superintendent of the Detroit branch of the American Car & Foundry Co., has been appointed a fire commissioner of the City of Detroit.

♦ ♦ ♦

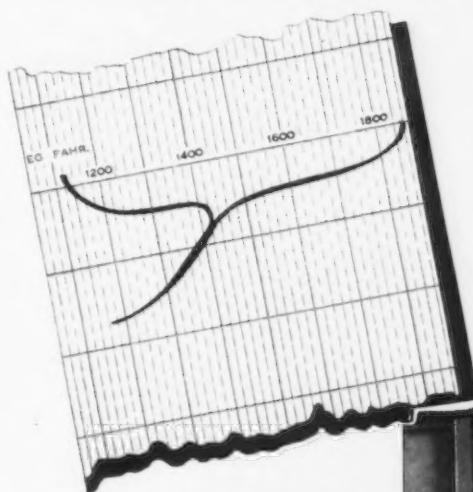
R. C. INGERSOLL, president of the Ingersoll Steel & Disc division, Borg-

Warner Corp., has been named chairman of the new ways and means committee of the Illinois Chamber of Commerce. The newly created committee, which consists of 56 business men and industrialists, will be charged with the responsibility of translating into action the Chamber's 1940-41 program.

♦ ♦ ♦

PAUL S. LANE, formerly research engineer and metallurgist for American Hammered Piston Ring Division,

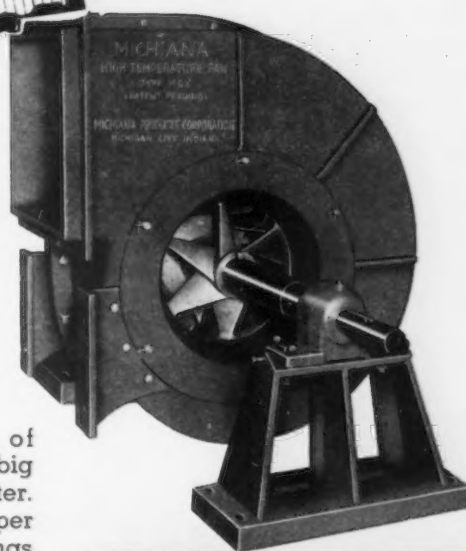
For handling HOT GASES in this high Temperature Range



Especially designed and constructed of *heat-resistant alloy castings* — MICHIANA High Temperature Fans have outlived many times over the fans heretofore available.

In the galvanizing plant of a large steel plant, re-circulating the hot gases by means of Michiana Fans has made big savings in fuel and spelter. Heat transfer in B.t.u.'s per square foot per hour has been increased. Output of kettles is greater and spelter deposit more uniform.

MICHIANA FANS withstand the high temperatures and make sizable savings that quickly pay for their slightly higher initial costs . . . Let us mail you our Bulletin 638. . . . MICHIANA PRODUCTS CORPORATION, Michigan City, Indiana.



MICHIANA
High Temperature
FANS

Koppers Co., Baltimore, Md., has joined the Muskegon Piston Ring Co., Muskegon, Mich.

♦ ♦ ♦

NATHAN H. JACOBS, of Buffalo Housewrecking & Salvage Co., Buffalo, has been elected president of the Buffalo chapter of the Institute of Scrap Iron and Steel, Inc., succeeding D. SLOAN HURWITZ, of Hurwitz Bros. Iron & Metal Co., Inc., Buffalo, who retires after having served two terms. Other officers elected include MAX

PRESSLER, of Summer & Co., Buffalo, vice-president, and LEO CHAPIN, of Chapin & Fagin, Inc., Buffalo, secretary-treasurer.

♦ ♦ ♦

BENJAMIN T. MOFFATT, who has had an extended experience in the mechanical rubber goods industry, has been appointed New York district manager of the Hewitt Rubber Corp., Buffalo, N. Y.

♦ ♦ ♦

CHARLES M. CHAPMAN has been made representative in southern Ohio

and contiguous territory in Kentucky and Indiana for the Hays Corp., Michigan City, Ind. He has established headquarters in the Schmidt Building, Cincinnati.

♦ ♦ ♦

CHARLES E. MAYETTE has been added to the sales engineering staff of the Underground Steam Construction Co., Boston.

♦ ♦ ♦

R. P. PROFFITT has been made Chicago division manager of the Timken Roller Bearing Co., Canton, Ohio. He first served as an engineer in the industrial bearing division in 1923 and later was identified with the St. Louis branch office. He was transferred to the Chicago office in 1933. Prior to 1923 he was associated with the American Car & Foundry Co.

National Metal Show Floor Plans Mailed

FLOOR plans for the 1940 National Metal Congress and Exposition have just been mailed to previous exhibitors in the shows, with requests for space reservations. The exposition will be held in Cleveland, Oct. 21-25, in that city's Public Auditorium. Former exhibitors are requested to make three choices of space locations, with deadline for receipt of requests set at April 6. Upon receipt of space reservations the assignment committee of the American Society for Metals, sponsors of the National Metal Congress, will make final allocations.

More than 90 per cent of the registrations at the 1939 show in Chicago included presidents, vice-presidents, treasurers, engineers, purchasing agents, metallurgists, managers and superintendents of various companies. The National Metal Congress is held simultaneously during the five days with the National Metal Exposition, and participated in by the American Society for Metals, American Welding Society, Wire Association, and the Iron and Steel Division and the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers. W. H. Eisenman is managing director of the show.

Crushed Steel Co. Builds

PITTSBURGH—H. K. Porter Co., Inc., has completed negotiations for the sale of 26,000 sq. ft. of surplus property to Pittsburgh Crushed Steel Co. The latter is building on a new site following damage by fire to their plant recently.

PERKINS Man Coolers

TRADE MARK REG. U.S. PAT. OFF.



- create refreshing recirculation of air without chilling drafts.
- help to maintain production schedules in the hottest places.
- decrease labor turnover and help to make contented workers.

PERKINS Man Coolers

are made in Oscillating and Stationary types, both, Portable.

B.F. PERKINS & SON, Inc.
Engineers and Manufacturers
HOLYOKE • MASSACHUSETTS

... OBITUARY ...

PAUL C. SAUERBREY, 60 years old, vice-president and general manager of the Plymouth Division of Chrysler Corp., died March 3 at Ft. Lauderdale, Fla. Mr. Sauerbrey had been in ill health. A native of New York City, he received his formal schooling in the public schools there and at Cooper Union. He joined the Mergenthaler Linotype Co. as an apprentice, after which he became a journeyman-mechanic in the railroad industry. His first employment in the automotive industry was with the Timken Axle Co.,



PAUL C. SAUERBREY, late vice-president and general manager of the Plymouth Division of Chrysler Corp.

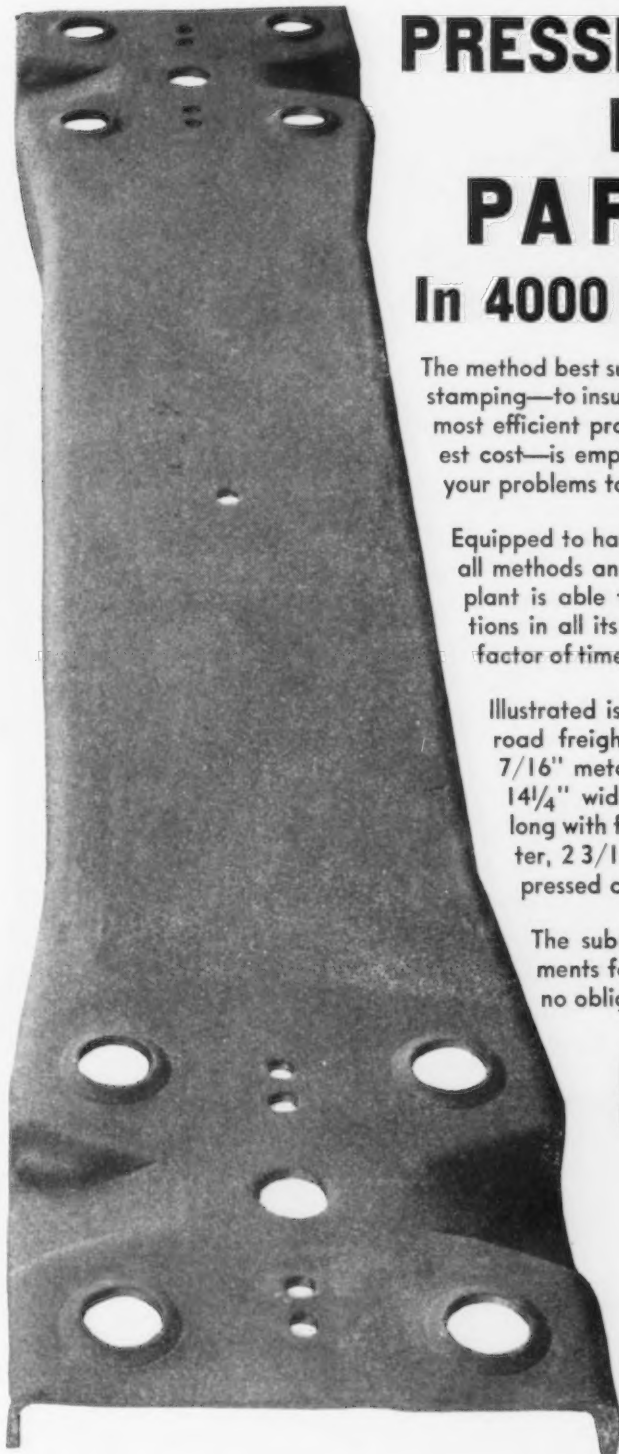
Detroit. Subsequently he became manager of the Muncie Products plant, Muncie, Ind. In 1926 he joined Chrysler Corp. on the staff of K. T. Keller, now president. He organized the Plymouth Division, and in 1929 he was made vice-president in charge of manufacturing of the Plymouth Division, with which he remained until the time of his death.



WALTER J. GUTHRIE, vice-president, Apollo Steel Co., Apollo, Pa., died March 2 in Miami, Fla., aged 75 years. Mr. Guthrie also was a director of the Apollo Trust Co. and associate general counsel, secretary, and director of various Gulf Oil subsidiary companies. From 1907 to 1920 he was secretary and attorney for the Pennsylvania Gulf Oil Corp., Pittsburgh.

CHARLES A. WHITE, secretary-treasurer of Leeds & Northrup Co., Philadelphia, died March 2 at Germantown Hospital at the age of 58. Mr. White was born in Poughkeepsie, N. Y., and spent several years in the dry goods business after finishing school. From 1902 to 1914, he was associated with Adriaance Platt & Co., farm machinery manufacturers. In 1915 he joined the Hero Mfg. Co., serving first as a cost accountant and later as a purchasing agent. He was president of the Philadelphia Rotary Club in 1935.

JOHN A. GEISMAR, aged 61, president, National Supply Co., Pittsburgh, died March 5 at his home in Toledo, Ohio. Mr. Geismar had been connected with National Supply for 39 years, having started as a clerk in 1901. He later became manager of the company's plant at Toledo and in 1919 was made head of the general sales organization. He became vice-president and general manager in 1924 and assumed the presidency last year when John M. Wilson resigned to become chairman of the board.



PRESSED COLD by **PARISH** **In 4000 ton Press**

The method best suited for each particular stamping—to insure most effective results, most efficient production and most modest cost—is employed when you present your problems to the Parish plant.

Equipped to handle all types of work in all methods and sizes of stamping, our plant is able to meet your specifications in all its elements, including the factor of time.

Illustrated is a Spring Plank for railroad freight car trucks. Made of 7/16" metal—165/8" wide at ends, 14 1/4" wide at center, and 93 1/4" long with flanges 3 3/8" high at center, 2 3/16" high at ends—it was pressed cold from heavy steel.

The submission of your requirements for review involves you in no obligation.

PARISH
PRESSED STEEL CO.
READING, PENNA.

Pacific Coast Representative
F. Somers Peterson Co.,
57 California St.,
San Francisco, California.



CLYDE C. HUFFMAN, 52 years old, died March 6 in Highland Park General Hospital, Highland Park, Mich. He was shop superintendent of the Steel Plate & Shape Co. and formerly shop superintendent at Whitehead & Kales Co. and the Anchor Steel Co.

CAPT. HARTMAN RICHARDSON CORNELL, employed by the Cleveland-Cliffs Iron Co. for 30 years, died March 6 in the United States Marine Hospital at Detroit. His home was in Dearborn, Mich.

DANIEL D. WESSELS, active as a manufacturer in Detroit since 1894, died on March 6 at his home. He was born in 1862 in Avoca, N. Y., and was first employed in Michigan as a paymaster of the Detroit & Mackinac Railway Co. at East Tawas. In 1900 he became a member of the firm McDonald, Wessels & Ames Co., a bicycle firm. Four years later he organized the Detroit Concrete Stone Co. and in 1908 he organized D. D. Wessels & Sons Co., manufacturers of plumbers'

supplies, of which he was chairman of the board at the time of his death.

CHARLES E. WAIN, owner of the Wain Machinery Sales Co., Detroit, died recently in that city. He was 74 years old.

HUTTON H. HALEY, Michigan representative of the American Foundry Equipment Co., Mishawaka, Ind., died on March 1. Mr. Haley, who was 53 years old, went to Detroit in 1914. He had been associated with the American Foundry Equipment Co. and its predecessors for 30 years. He was sales manager of the company in 1926 but resigned that post to take charge of sales in the Detroit territory.

HENRY C. MILLIGAN, chairman, Republic Stamping & Enameling Co., Canton, Ohio, died March 8 in Canton, aged 87 years. He was one of the founders of the Crescent Enamel Co. in 1896, which was merged later with the Carnahan Stamping & Enameling Co. of Canton. Born in New York City, Mr. Milligan also organized the Newark Stamping Co., Newark, N. J.

DR. CHARLES T. HENNIG, 73, consulting metallurgical engineer and founder of the Hennig purifier, died March 5 in Green Springs, Ohio, after a long illness. He was widely known in Ohio and Pennsylvania. He had been associated with Columbia Alkali Corp. since 1926.

CHARLES EDWARD CONLEY, manager of the city sales department of the Chicago warehouse of Jones & Laughlin Steel Corp., died last week aged 79 years. Mr. Conley was rounding out 56 years of service with the company in Chicago. Since 1927 when J. & L.'s mill and warehouse business was separated in the Chicago district Mr. Conley continued to represent the mill on railroad accounts.

ARTHUR H. A. KUNZ, since 1936 a member of the New York sales force of the Wheeling Steel Corp., Wheeling, W. Va., died at his home in Hempstead, L. I., on March 8, aged 60 years. He started in the tin plate business in New York in 1900 with the old firm of Dickerson, Van Dusen & Co. and was with that firm until it was liquidated in 1936.

ALVA L. KITSELMAN, president and founder of Kitselman Brothers, Muncie, Ind., died at Loma Linda, Cal., on

SAVE TIME! SAVE MONEY!
ON BRUSHES

to manufacturers of light gauge steel.

INSTALL Pittsburgh Plate Glass Company's Spiral Wound brushes. They'll help you cut finishing costs and speed up production.

These Spiral Wound brushes may be had in various fills—horsehair, tampico or nickel silver wire. And all are refillable.

Talk with our representative regarding your finishing problems. He will gladly work with you in developing special Spiral Wound brushes to meet your individual requirements. Write for further information.

**PITTSBURGH
PLATE GLASS COMPANY**
BRUSH DIVISION · BALTIMORE, MD.

Warehouses In 81 Important Market Areas

March 4, aged 84 years. He was a pioneer inventor and manufacturer of wire fence and fence weaving machinery, having invented a hand-driven loom which wove fence in the field in the early '80's.

♦ ♦ ♦

ARTHUR H. ANTHONY, president and general manager of Massillon Steel Castings Co., Massillon, Ohio, died Feb. 29 in Mound Park Hospital at St. Petersburg, Fla., after an emergency operation for appendicitis. He was 59 years old.

♦ ♦ ♦

JOHN F. TREMMEL, who has been shop superintendent of the Lakeside Bridge & Steel Co., Milwaukee, for the past 20 years, died Feb. 29 in his home in Wauwatosa, Wis., at the age of 46 years after a long illness. He was a native of Milwaukee.

♦ ♦ ♦

GEORGE HERBERT HALL, 59, secretary and one of the founders of Cleveland Rock Drill Co., died at Lakeside Hospital, Cleveland, March 7. He was born in Charlestown, Mass., and received his bachelor of science and master of engineering degrees at Case School of Applied Science. Mr. Hall was at one time president of the Commonwealth Savings & Loan Co., vice-president of Federal Packing Co., treasurer of Cleveland Pneumatic Tool Co. of Canada, Ltd., and a director of Fidelity Mortgage Co. He was 59 years old.

♦ ♦ ♦

CARL F. BURKHART, production manager, Federal Gear, Inc., Cleveland, died March 5, aged 50 years.

♦ ♦ ♦

FRANK CHAMPION BLAIR, 89, until his retirement in 1928 head of the old Blair Foundry at Waukesha, Wis., died at a local hospital March 4 following an illness. He had been associated with the company throughout his lifetime, taking over its ownership at the death of his father, the late William Blair, when he passed away in 1880. Mr. Blair operated the foundry until he sold it to retire from active business. He had been prominent in civic affairs and had held the office of city treasurer, and had been a member of the county board of supervisors.

♦ ♦ ♦

JAMES W. NEWELL, who retired in 1914 as a partner in the Boston firm of Page, Newell & Co., importers of Swedish iron and steel, died March 5 at his home in Brookline, Mass. Mr. Newell was born on Summer St., in downtown Boston, then a residential

district, Feb. 13, 1849, and was educated in the public schools of that city.

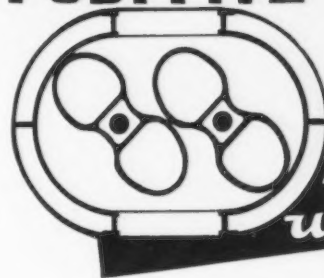
♦ ♦ ♦

COL. EDWIN W. M. BAILEY, who with his father established the Bailey Mfg. Co., Amesbury, Mass., automobiles and automobile bodies, in 1917, died at his Winter home in the Barbados, West Indies, Friday, March 8. He was born in Skowhegan, Me., 76 years ago. Mr. Bailey was associated with Thomas Edison in the application of the Edison battery in the electric automobile.

1000 At Rail Meeting

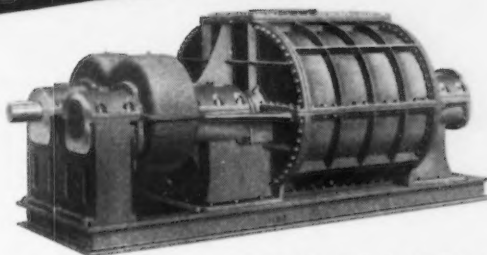
CHICAGO—More than 1000 officials and research men from American and Canadian railroads are here this week for the 41st annual meeting of the American Railway Engineering Association. In conjunction with the A R E A technical meetings which will be held at the Palmer House, members of the National Railway Appliances Association are exhibiting railway construction and maintenance equipment at the International Amphitheatre.

POSITIVE DISPLACEMENT



*Puts AIR and GAS
where you want it.*

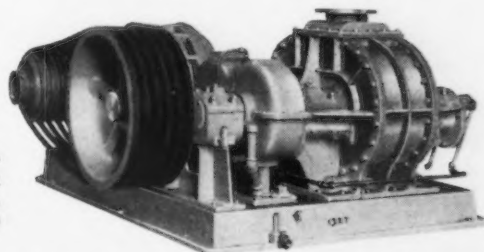
Gas Pumps



Gas booster delivering 780,000 C.F. Hr. of coke oven gas against 4½ lbs. pressure.

In choosing the type of gas booster or exhauster for any particular application it pays to know the advantages of "R-C" Positive Displacement Gas Pumps. Boiled down to fewest words, the essential advantages are these—"R-C" Gas Pumps take less power, are suitable for varying pressures, are positive in displacement, and give years of trouble-free service. Detailed data on the subject is given in our new Bulletin No. 32-33-B-11. Ask for your copy.

Blowers



"R-C" Blowers have the same advantages as the gas pumps. Built for pressures from 8 ozs. to 15 lbs. and for any volume up to 50,000 CFM.

Remember, too, that no liquid or seal is used inside "R-C" rotary positive displacement units so that air or gas is delivered as clean as at inlet and in definitely measured volume that is unaffected by changes in temperature or barometer.

Blower with capacity of 1800 C.F.M. of AIR at 3½ lbs. gauge pressure.

Roots
CONNERSVILLE

BLOWER CORPORATION

403 Ohio Ave.

Connersville, Ind.

NEW YORK CHICAGO POTTSTOWN, PA. SAN FRANCISCO
DETROIT ST. LOUIS LOS ANGELES PITTSBURGH BOSTON



Tool Engineers Hold Successful Meeting in New York

(CONTINUED FROM PAGE 48)

puting the modified forms of the tools. To simplify this work, Mr. Berry has devised a system of correction tables which can be applied to either circular form tools or flat form tools. These tables will transform a radial step on a product into a relative amount in the inclined plane of the top rake.

The use of the tables is said to shorten the usual calculation time by as much as 75 per cent.

N. W. Taylor, foreman, automatic screw machine department, Wright Aeronautical Corp., indicated that circular form tools are being widely used on single spindle automatics, but are not practicable on multiple spindle automatics on account of the rubbing action on the side faces. For this application, flat form tools are favored. Top rake is used in most instances.

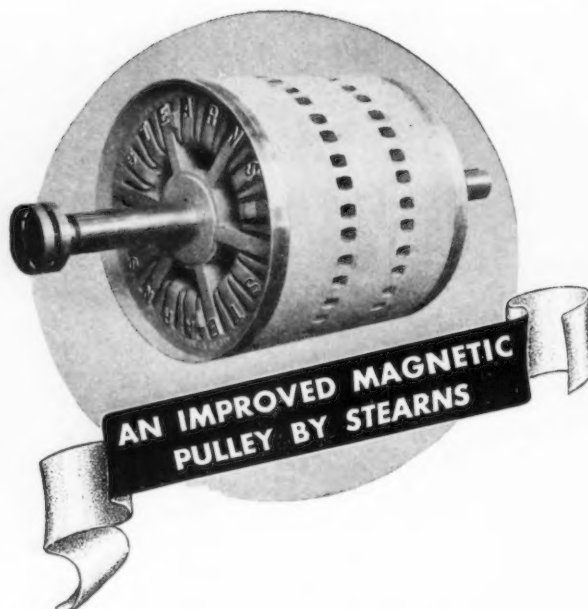
Consistent performance results in screw machine tooling, Mr. Taylor attributed to two factors—standardization of cutting oils and rigid specifications of the materials cut. Wright Aeronautical Corp. first standardized on a high sulphurized base oil that was mixed with parafin and engine oil. Later, for special applications, a sulphur chlorinated oil with parafin dilutions was introduced. The material cut is largely alloy steel and more uniformity in this material is obtained by specifying a specific structure, grain size and close limitations in the reduction of area, more important than other "physicals." The cutting material is super high speed steel, and with these variables under control fairly consistent results in the number of pieces per tool grind have been obtained.

There were two other speakers on this program—L. B. Gilbert, manager, time and methods department, Columbus-McKinnon Chain Corp., and C. C. Stevens, mechanical superintendent, New Departure Division, General Motors Corp. Mr. Gilbert indicated that low production shops have been slow in adopting form tooling, but with added rigidity built into modern screw machines, this tooling is being more widely used. Mr. Stevens devoted his talk to an analysis of the distinguishing characteristics of various types of automatics now on the market and indicated the possibilities of the equipment by examples of unusual forms of tooling on each type.

Cutting Tools

Other sessions were devoted to tooling for plastics, punches and dies, and cutting tools and materials. The symposium on cutting tools formed the subject of the closing session of the convention on Saturday morning. Lead-off speaker was E. S. Chapman, general works manager, Plymouth division, Chrysler Corp., who indicated that his division has been able to save hundreds of thousands of dollars annually by keeping detailed records on the most suitable tool material for a tool performance and costs from which given job could be ascertained. L. C. Gorham, president, Gorham Tool Co., Detroit, reviewed the various types of high speed steels available. He saw great promise for the newly developed stabilized molybdenum high speed steels, which are not subject to decarburization during heat treatment in an ordinary furnace. With controlled atmosphere furnaces or salt baths, he pointed out that ordinary molybdenum high speed steel could be readily heat

STEARNS Pioneered the COOL Magnetic Pulley



Today's accepted principle of forced ventilation in magnetic pulleys has always been a feature of STEARNS design and construction.

Now—still greater cooling is provided by STEARNS better engineering through increased heat radiation area in a ribbed design which allows for deeper coils with more ampere turns and consequent greater magnetic pull.

Supporting arms to which the shaft is keyed are cast integral with the magnet body. Shaft is shouldered down from extra large long wearing alloy steel stock to absorb the stresses and strains from heavily loaded long conveyor.

A rugged magnetic pulley with power, economy and trouble-free operation at maximum peak loads for separation, protection, reclamation, purification or concentration.

For complete information and details write for Bulletin No. 301

SEPARATORS — DRUMS — ROLLS
CLUTCHES — BRAKES — MAGNETS

STEARNS

MAGNETIC MFG. CO.

635 So. 28th Street, Milwaukee, Wis.



treated without danger of decarburization.

The case for the cemented carbides was presented by W. G. Robbins, president, Carbology Co., Detroit, who indicated that the monthly consumption of carbides is now equal to the yearly consumption in 1934. The present trend is toward standardization of carbide materials and today, two grades—one for cast iron and one for steel cutting—take care of the majority of requirements. One of the most important factors in cutting steel is the use of a chip breaker. Of the several types available, Mr. Robbins recommended the one produced by the grinding of angle across the face of the tool.

Steel is being more successfully cut by carbides in Europe than in the United States, but rapid progress is being made here and about five times as much steel cutting is being done today as was the case two years ago. Mr. Robbins also noted a trend toward the use of carbide tipped tools as general tools in industry; heretofore they have been largely applied to specific, high production jobs. The session on cutting tools was closed by Mr. d'Arcambal who reviewed some of the newer applications to high speed steel tools, particularly to the cutting of magnesium.

Boiler, Plate Fabricating Minimum Wages Studied

WASHINGTON—Employer and employee representatives of the boiler and steel plate fabricating industries were scheduled to meet with officials of the Labor Department's Public Contracts Division Thursday, preliminary to determining the prevailing wage minima under the Walsh-Healey Public Contracts Act.

Under discussion are three proposed definitions: (1) for the boiler shop products manufacturing industry; (2) for the steel plate fabricating industry; and (3) a definition proposing to combine both. The latter definition follows:

"The boiler shop products manufacturing industry is that industry which manufactures industrial or power boilers and hot-water boilers to be operated at pressures exceeding 160 lb. or temperatures exceeding 250 deg. F., industrial boiler room heaters, and such related products as buoys, tanks, smokestacks, pressure vessels, and penstocks when fabricated from metal plates $\frac{1}{8}$ in. and up in thickness."

After a definition is agreed upon, a statistical survey of wages paid in the industry will be taken, after which

a public hearing will be called to permit interested parties to make their views known to Administrator L. Metcalfe Walling and members of the Public Contracts Board.

New Jersey Iron Ore Output Doubled in 1939

OUTPUT of high-grade iron ore from mines in New Jersey in 1939 was 395,000 tons, an increase of 280 per cent over the 139,890 tons produced in 1938, the State Department

of Conservation and Development reports. The 1939 production was valued at \$2,135,000, while the 1938 output was valued at \$761,000.

A large part of the 1939 output was in the form of concentrates running 63 to 67 per cent Fe, but some high-grade lump ore was shipped from the Mt. Hope mine near Dover, and from the Richard mine near Wharton.

The Scrub Oak mine near Dover established a new production record for New Jersey mines by producing 709,000 tons of crude ore in 1939, the report revealed.

ON THEY ROLL using 40% LESS POWER



POWER COSTS CUT... PRODUCTION ON SCHEDULE!

Stepped-up production in many mills means "step up the power." But—here's another success story for SUN, where power costs in one large mill were actually reduced by 40%. Success in terms of savings . . . thanks to SUN Heavy Duty LUBRICANTS.

And, there were additional savings on down the line! 27% less lubricants were used at peak production levels—with \$1400.00 savings in the first six months.

Steel men judge lubricants based on results only. And it's "results" that will prove the merits of SUN H. D. LUBRICANTS in your plant. A SUN Technical Representative can aid you in obtaining better "all 'round performance." Write . . .

SUN OIL COMPANY, Philadelphia, Pa.

SUN HEAVY DUTY LUBRICANTS

PETROLEUM PRODUCTS FOR ALL INDUSTRIES



Photo Courtesy John P. Mudd

THE IRON AGE, March 14, 1940—83

Portable Electric "BUDGIT" HOISTS



BEFORE THE "BIG BOSS" STARTS CHECKING INTO COSTS..

Change costly waste into profit by installing "Budgit" Electric Hoists wherever you now lift by hand or with chain blocks! .. They increase profits by turning waiting time of machines and men into working time.

"Budgit" Hoists come in 250, 500, 1000, and 2000 pounds lifting capacity with speeds to suit today's tempo . . . All weigh so little you can move them from job to job.

Slim budgets can afford "Budgits"! Prices start at \$119. Nothing else to buy before you can use them. You simply Hang Up, Plug into the nearest electric socket, and Use!

Send for catalog containing complete information, also "Time Savings Calculator" that shows savings they earn.

SHAW-BOX CRANE & HOIST DIV.
MANNING, MAXWELL & MOORE, INC.

402 BROADWAY • MUSKEGON, MICH.



Makers of all types and sizes of Electric and Hand Operated Cranes and Electric Hoists . . . Send your crane and hoist inquiries to "Shaw-Box"!

Hang Up, Plug In, USE!

PRODUCTION OF OPEN-HEARTH AND BESSEMER STEEL INGOTS (Reported by Companies Which in 1936 Made 98.67 Per Cent of the Open-Hearth and 100 Per Cent of the Bessemer Ingot Production)

	Reported Production (Net Tons)		Calculated Production All Companies		Number of Weeks	Per Cent of Capacity
	Open-Hearth	Bessemer	Monthly	Weekly		
1939						
January	3,344,830	165,193	3,555,274	802,545	4.43	52.48
February	3,085,746	219,728	3,347,288	836,822	4.00	54.72
March	3,547,915	218,057	3,814,013	860,951	4.43	56.30
1st Quarter	9,978,491	602,978	10,716,575	833,326	12.86	54.49
April	3,059,225	230,464	3,331,156	776,493	4.29	50.78
May	3,041,853	190,575	3,273,621	738,966	4.43	48.32
June	3,246,378	209,975	3,500,322	815,926	4.29	53.35
2nd Quarter ...	9,347,456	631,014	10,105,099	776,718	13.01	50.79
1st 6 months ..	19,325,947	1,233,992	20,821,674	804,858	25.87	52.63
July	3,241,186	256,906	3,542,038	801,366	4.42	52.40
August	3,885,787	276,586	4,215,027	951,473	4.43	62.22
September	4,347,352	332,783	4,739,067	1,107,259	4.28	72.41
3rd Quarter ...	11,474,325	866,275	12,496,132	951,724	13.13	62.23
9 Months	30,800,272	2,100,267	33,317,806	854,303	39.00	55.86
October	5,512,718	453,600	6,041,079	1,363,675	4.43	89.17
November	5,589,235	453,103	6,118,131	1,426,138	4.29	93.26
December	5,358,320	353,250	5,784,150	1,308,631	4.42	85.67
4th Quarter ...	16,460,273	1,259,953	17,943,360	1,365,553	13.14	89.30
Total	47,260,545	3,360,220	51,261,166	983,145	52.14	64.29
1940						
January	5,262,760	285,714	5,619,698	1,268,555	4.43	*83.58
February	4,113,446	205,527	4,374,625	1,056,673	4.14	69.62

*Revised.

February Ingot Output at 69.62%

STEEL ingot production during February totaled 4,374,625 net tons, according to the American Iron and Steel Institute. The February total showed a decline from the January figure of 5,619,698 net tons because of the lower rate of operations and the shorter month. Last month's figure, however, was more than 30 per cent above February, 1939, when 3,347,288 net tons of open-hearth and Bessemer steel ingots were produced.

An average of 1,056,673 net tons of ingots was produced weekly during February, or about 17 per cent less than the January weekly average of 1,268,555 net tons. In February of last year, an average of 836,822 net tons of ingots was produced per week.

During the month just closed the steel industry operated at an average of 69.62 per cent of capacity, which compares with operating rates of 83.58 per cent (revised) in January and 54.72 per cent in February, 1939.

Sheet & Tube's Tax Burden Increases

YOUNGSTOWN — Youngstown Sheet & Tube Co.'s taxes rose from \$3,685,000 in 1938 to \$4,297,000 in 1939, according to its annual pamphlet report for 1939. The increase was caused by additional income taxes and partly by increased payroll taxes for unemployment compensation and old age benefits.

The report states that while operations in 1939 based on ingot capacity were about 69 per cent greater than in 1938, volume of dollar sales was only 38 per cent greater. Net profit for the year before payment of \$825,000 in regular preferred dividends was \$5,004,484. Stockholders were told that steel prices did not recover from the reductions made in the latter part of June, 1938, and prices realized in 1939 on several important products were considerably lower than the reduced prices which became effective in June, 1938. More than two-thirds of the

company's total earnings for the year were made during the last four months of 1939.

In addition to the usual charges for maintenance, \$19,686,264 was expended for plant improvements and betterments, including the new facilities at Indiana Harbor. Of this amount approximately \$15,700,000 represented unexpended proceeds at Dec. 31, 1938, from the sale in 1938 of the company's convertible 4 per cent debentures after expense of sale and payment of \$12,500,000 in bank loans. Properties valued at \$3,717,081 were dismantled or otherwise disposed of during the year.

While new business since Jan. 1, 1940, has been at a low rate, stockholders were told the actual consumption of steel exceeds current new business and that when present stocks have been reduced, buying again will increase.

Enclosed with the pamphlet report was a copy of resolutions adopted by the board of directors with respect to the death, Dec. 27, 1939, of H. G. Dalton, chairman of the board.

France Suspends Import Duties on Steel Products

WASHINGTON—Suspension of import duties in France and Algeria on certain iron and steel products for the duration of the war is reported in a cablegram received by the Commerce Department from the American Embassy at Paris. Products exempted include crude iron and steel, ingots, rolled or forged steel, machine iron and steel, hoop iron or steel, sheets, flat sheet nickel steel, hot rolled bands, rails, ordinary gage railroad sleepers, and parts for portable railroads.

National Supply Chairman Sees First Quarter Gain

PITTSBURGH—Tubular sales thus far in 1940 would indicate a first quarter considerably better than the corresponding quarter in 1939, according to John M. Wilson, chairman, National Supply Co. He stated, however, that any estimates based on present trends are hazardous.

The company reported for 1939 a net profit of \$1,190,786, compared with a net profit for 1938 of \$1,283,766. Increased business during the last half of 1939 was responsible for turning a loss of \$547,369 for the first half of 1939 into a profit for the full year.

The company will have ready for operation about April 1, 1940, at its Spang Chalfant plant, a second continuous butt weld pipe mill.

Small Plane Makers Form Trade Organization

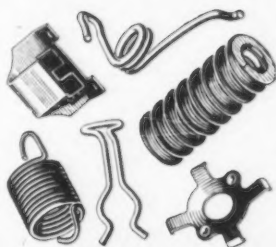
CLEVELAND—Executives of the nation's leading manufacturers of small airplanes and aircraft motors have announced the formation of a trade organization to take advantage of an expected spurt in private aviation.

Meeting in Hotel Carter here last week the executives chose a committee headed by Richard H. Depew, Jr., vice-president and general manager, Taylor-craft Aviation Corp., Alliance, Ohio, to form the association.

Other committee members are: J. H. Torrens, president, Luscombe Airplane Corp., West Trenton, N. J.; William A. Mara, vice-president, Aviation Manufacturing Corp.'s Stinson Aircraft division, Detroit; William L. Pinney, Porterfield Aircraft Corp., Kansas City, Mo.; W. T. Piper, president, Piper Aircraft Co., Lock Haven, Pa., and Carl Wooten, Aeronautical Corp. of America, Cincinnati.



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... THE NEWS IN BRIEF ...

Tool engineers hold successful meeting in New York.—Page 44.

Wagner Act amendments, proposed by special House committee, faces stormy session.—Page 54.

WPA estimates it spends \$4,800,000 monthly for iron and steel products, \$1,500,000 for machinery and equipment.—Page 56.

Wage-Hour division will no longer assign staff lawyers to represent industrial committees.—Page 56.

Denmark extends import license requirements to some hand tools.—Page 58.

Metal-working machinery exports from the U. S. in 1939 totaled \$117,473,883, a 16 per cent gain over 1938.—Page 58.

Strategy of Administration leaders blocks bill curbing New Deal agencies.—Page 60.

Precipitron units to purify air installed at Weirton Steel Co. plant.—Page 62.

Brown & Sharpe Mfg. Co. apprentice graduates hold reunion.—Page 62.

Republic Steel Corp. blast furnace rebuilding program to give company four 1000-ton stacks.—Page 62.

Demand for steel continues to gain in Canada; plate and sheet orders placed in U. S.; ingot output at all-time peak.—Page 64.

Tri-State industrialists hold meeting at Pittsburgh under NAM sponsorship.—Page 66.

Detroit railway purchasing agent threatens protest against identical bids on car wheels.—Page 66.

Bridgeport tool exhibition draws large attendance.—Page 68.

Interpretation of some points in census provided steel manufacturers.—Page 69.

Contract for plant 238 x 430 ft. awarded to Austin Co., Cleveland.—Page 69.

Industry awaits action on bill clipping powers of Federal agencies.—Page 70.

Harold M. Foster is president of newly-organized Foster Steel Treating Co., Newark.—Page 70.

Nazis halt German technical progress, U. S. engineers declare.—Page 71.

Steel credit men to meet at Toronto, May 19-23.—Page 71.

Douglas Aircraft Co. already employs 15,000, plans to hire more.—Page 71.

Electro Metallurgical Co.'s new ferro-alloy plant at Sheffield, Ala., to start operations April 1.—Page 71.

Government orders for iron and steel products total \$843,812 for week ended March 2.—Page 72.

Treasury receives bids for 5000 tons of manganese.—Page 73.

Labor Board calls for disestablishment of Federation of Baldwin Locomotive Works employees.—Page 73.

Floor plans for 1940 National Metal Congress mailed to exhibitors with requests for space reservations.—Page 78.

Heavy engineering construction contracts in February total \$270,928,000, highest since 1929.—Page 78.

Pittsburgh Crushed Steel Co. builds new plant after fire.—Page 78.

1000 officials and research men attend the 41st annual meeting of the American Railway Engineering Association.—Page 81.

Output of iron ore from New Jersey mines up 280 per cent to 395,000 tons in 1939.—Page 83.

Public Contracts Division, Labor Department, to determine wage minima for boiler, plate fabricating industries.—Page 83.

Steel ingot production in February 4,374,625 tons; operations averaged 69.62 per cent.—Page 84.

Youngstown Sheet & Tube Co.'s 1939 taxes increased to \$4,297,000.—Page 84.

Executives of small airplanes and aircraft motors form trade organization at Cleveland.—Page 85.

Pipe sales indicate more active first quarter than in 1939, National Supply Co. chairman says.—Page 85.

Jones & Laughlin Steel Corp.'s operations averaged 60 per cent in 1939, compared with 37 per cent in 1938.—Page 89.

Iron Age capital goods activity index declines 1½ points to 80 per cent.—Page 91.

Pittsburgh Coke & Iron Co. buys tract of land from Carnegie-Illinois Steel Corp. subsidiary.—Page 99.

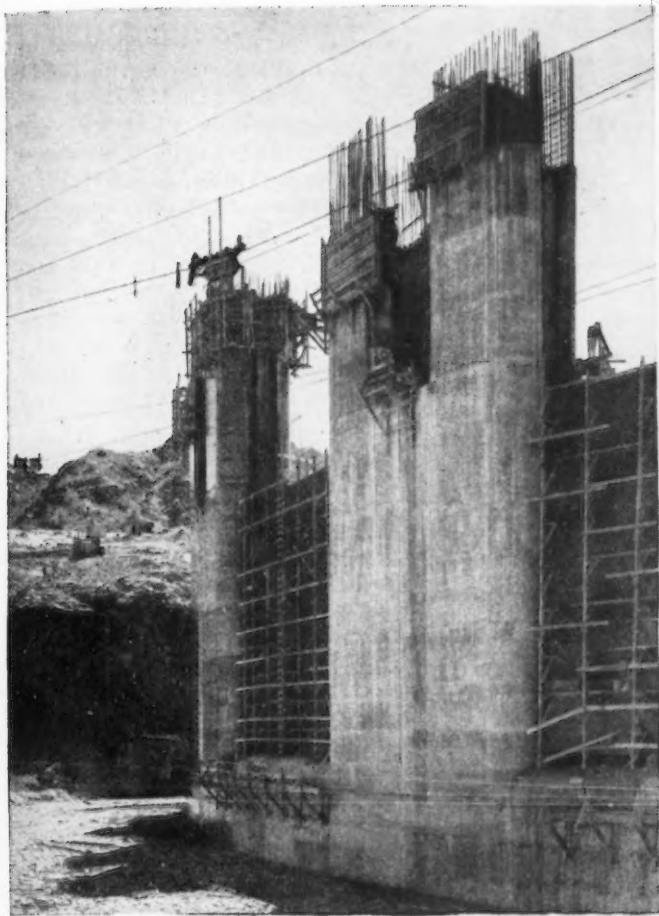
\$18,000,000 building program by the Michigan Bell Telephone Co. announced.—Page 110.

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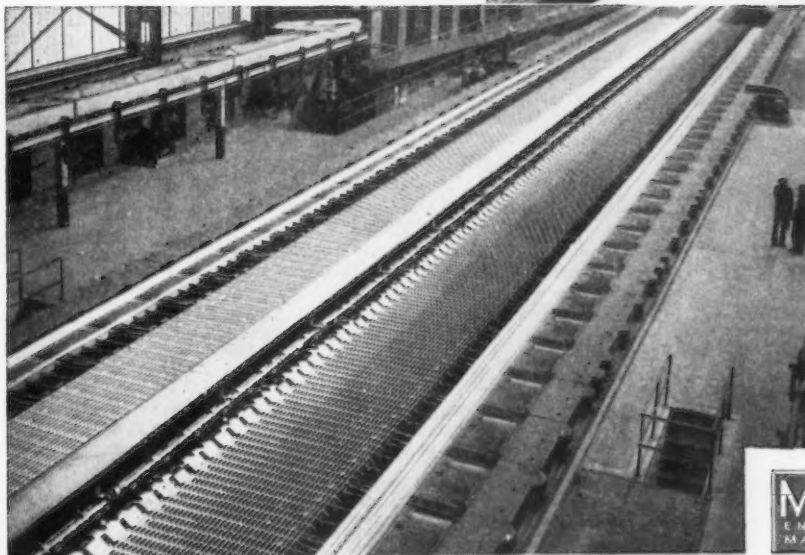
MEETINGS

- April 10 to 12—International Acetylene Association, annual convention, Milwaukee.
- April 11 and 12—Galvanizers Committee of American Zinc Institute, annual spring meeting, Pittsburgh.
- April 25 and 26—Concrete Reinforcing Steel Institute, 16th annual meeting, Hot Springs, Va.
- May 6 to 10—American Foundrymen's Association, annual meeting and equipment exhibition, Chicago.
- May 7 and 8—Society of Automotive Engineers, national production meeting, Hartford.
- May 20 to 22—American Gear Manufacturers Association, annual meeting, Asheville, N. C.
- May 23—American Iron and Steel Institute, annual meeting, New York.



Steel lace against the sky, on the left shoulder of Parker Dam, curved against the flow of the Colorado River. Here work is in progress in the spillway openings and columns and gate guides. Three hundred and eighty-three feet is the over-all height of this dam.

Below: An automatic carry-over cooling bed receiving deformed concrete bar, double strand, from a Morgan Continuous Mill at the rate of 60 to 65 tons an hour.



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THE IRON AGE, March 14, 1940—87

Listing of Steel Scrap Futures Studied by Commodity Exchange

NEW YORK—The possibility of establishing trading in scrap steel futures on the Commodity Exchange is being explored here by members of the scrap industry and officials of the exchange. Several informal conversations have been held and among the subjects discussed have been a standardized contract, delivery points, alternate grades, district differentials and limits on daily fluctuations.

It is understood that thus far Pittsburgh, Philadelphia and Chicago are favored as delivery points and No. 2 steel as the alternate deliverable grade. A contract, the trading unit, would probably be set at about 250 tons.

First public indication that futures trading in scrap was being considered was given by Benjamin Schwartz, vice-president of Schiavone-Bonomo Corp., in a paper read at the annual meeting of the Institute of Scrap Iron and Steel in Pittsburgh in February.

This was followed by the appointment by the Commodity Exchange of a committee to study the problem. At present copper, lead, zinc and tin futures are traded on the Commodity Exchange, in addition to other non-metallic commodities. The present permissible limit of daily price fluctuations is equal to about 10 per cent of price per unit of the commodity.

Average number of employees in 1939 was 16,425, compared with 13,844 in 1938 and 20,185 in 1937. Average earnings per employee per year amounted to \$1,863 in 1939 compared with \$1,742 in 1938 and \$1,718 in 1937.

Total sales for Wheeling Steel in 1939 amounted to \$85,716,689, compared with \$62,420,280 in 1938 and \$90,455,381 in 1937. As of Dec. 31, 1939, the company's total inventories in dollar volume amounted to \$33,341,943 compared with \$30,762,273 at the end of 1938 and \$33,603,642 at the end of 1937.

ICC Hearings

WASHINGTON—Scheduled to last five days, hearings on interstate trade barriers will begin March 18 before the Temporary National Economic Committee. They will be presented by the Department of Commerce under the direct supervision of the Interdepartmental Committee on Interstate Trade Barriers. The committee is composed of representatives from nine governmental agencies.

U. S. Steel Subsidiary Shipments Decline

SHIPMENTS of finished steel products by U. S. Steel Corp. subsidiaries in February totaled 1,009,256 net tons, compared with 1,145,592 tons in January, a decrease of 136,336 tons, and with 747,427 tons in February, 1939, an increase of 261,427 net tons. For the year to date, shipments were 2,154,848 net tons, compared with 1,618,293 tons in the like period of 1939, an increase of 536,555 tons.

Wheeling Steel Building Program to Cost \$6,000,000

WHEELING, W. VA.—Wheeling Steel Corp.'s construction program for the immediate future will require expenditure of approximately \$6,000,000. Appropriations have been approved and several projects are under construction. Major improvement calls for additions, alterations, and improvements for the company's 60-in. hot strip mill and cold reducing sheet mills at its Steubenville plant. This project is now under way and its cost will approximate \$4,000,000.

According to W. W. Holloway, president, upon completion of the pres-

ent modernization program, all the plants in the corporation will have been affected except the Portsmouth plant, but additional expenditures may be required soon for improvement of steel producing facilities at the Portsmouth plant and eventually it may be desirable to provide additional finishing units at that plant.

Wheeling Steel has acquired a one-third interest in the Reserve Mining Co. which has a large potential iron ore reserve available for future development.

Net profit for the year was reported at \$5,560,753, compared with a net profit of \$493,138 in 1938.

Monthly Shipments of Finished Steel Products by United States Steel Corp.—Net Tons

Month	1936		1937		1938		1939		1940	
	Shipments	Per Cent of Capacity	Shipments	Per Cent of Capacity	Shipments	Per Cent of Capacity	Shipments	Per Cent of Capacity	Shipments	Per Cent of Capacity
January	795,214	44.8	1,268,403	75.4	570,264	33.7	870,866	51.8		
February	747,375	45.3	1,252,845	82.5	522,395	35.5	747,427	49.3	1,145,592	68.4
March	863,946	50.5	1,563,113	92.7	627,047	37.2	845,108	50.4	1,009,256	64.5
April	1,080,667	63.2	1,485,231	91.0	550,551	33.7	771,752	47.5		
May	1,087,395	63.4	1,443,477	85.5	509,811	30.2	795,689	47.4		
June	978,030	57.1	1,405,078	85.8	524,994	32.1	607,562	49.7		
July	1,050,085	61.3	1,315,353	77.9	484,611	28.8	745,364	44.5		
August	1,019,882	59.6	1,225,907	72.6	615,521	36.3	885,636	52.7		
September	1,060,708	62.0	1,161,113	71.1	635,645	37.5	1,086,683	66.9		
October	1,108,973	62.6	875,972	52.0	730,312	43.1	1,345,855	79.9		
November	974,292	59.2	648,727	39.7	749,328	45.6	1,406,205	86.1		
December	1,178,598	68.8	539,553	32.1	765,868	45.2	1,443,969	85.8		
Yearly adjustment..	(—)40,163	...	(—)87,106	...	(+)29,159	...	(—)44,865	...		
Total for year...	11,905,002	58.2	14,097,666	70.4	7,315,506	36.7	11,707,251	59.4		

The above table has been revised to conform with the practice of reporting shipments on a net ton basis inaugurated by the corporation in January, 1940. Previously, monthly shipments were reported as "tons," which included both net and gross tons on an unadjusted basis.

REINFORCING STEEL

... Awards of 9450 tons; 14,700 tons in new projects

AWARDS

ATLANTIC STATES

- 1175 Tons, Queens, N. Y., Queens approach, Midtown Tunnel, to Jones & Laughlin Steel Corp., Pittsburgh, through Fireproof Products, Inc.; Corbetta Construction Co., contractors.
- 900 Tons, Hudson, N. Y., Lone Star Cement Co. silos, to Bethlehem Steel Co., Bethlehem, Pa., through Rust Engineering Co.
- 550 Tons, New Haven, Conn., housing project, to Buffalo Steel Co., Buffalo.
- 520 Tons, Springfield, Mass., Mill River pressure tunnel, to Carnegie-Illinois Steel Corp.; F. H. McGraw, contractor.
- 500 Tons, Montgomery County, Md., gas holder, Charles H. Tompkins Co., to Rosslyn Steel & Cement Co., Rosslyn, Va.
- 262 Tons, Willowbrook, N. Y., hospital, to Concrete Steel Co.; Andrews & Andrews, contractors.
- 250 Tons, Washington, superstructure, Navy Yard building No. 200, to Republic Steel Corp., Cleveland, through Ceco Steel Products, Omaha; Harwood-Nebel Co., contractor.
- 206 Tons, New York, Kew Gardens, N. Y., Borough Hall, to Igoe Brothers.
- 170 Tons, Fulton County, Pa., Ray's Hill tunnel ventilation building, Pennsylvania Turnpike, to Truscon Steel Co., Youngstown, through Joseph F. Drass.

CENTRAL STATES

- 1125 Tons, St. Louis, city hospital, to Laclede Steel Co., St. Louis.
- 350 Tons, Oglesby, Ill., cement plant addition, to Inland Steel Co., Chicago, through John Metcalf Co., Chicago.
- 230 Tons, Detroit, Sisters of St. Dominic school, to Truscon Steel Co., through Darin & Armstrong, contractors.
- 160 Tons, Chicago, intercepting sewer No. 10, to Joseph T. Ryerson & Son, Inc., Chicago, through Santucci Construction Co., contractor.
- 137 Tons, Licking County, Ohio, State highway project No. 273, to West Virginia Rail Co., through Ralph Myers, contractor.
- 120 Tons, Hamilton, Ohio, State highway project No. 281, to Pollak Steel Co., through Midwest Roads Co., contractor.

WESTERN STATES

- 900 Tons, Los Angeles, Ramona housing project, to Blue Diamond Corp., Los Angeles, through Baruch Corp., Los Angeles, contractor.
- 650 Tons, Los Angeles, Los Angeles River improvement, Section II, to Truscon Steel Co., Los Angeles, through William T. Loesch, Pasadena, Cal., contractor.
- 635 Tons, Antler, Cal., Sacramento River bridge, to Columbia Steel Co., San Francisco, through United Concrete Pipe Co., Los Angeles, contractor.
- 340 Tons, Scotia, Cal., Eel River bridge, to Soule Steel Co., San Francisco, through A. Soda & Son, Oakland, Cal., contractor.
- 170 Tons, San Francisco, Safeway Stores meat plant, to Ceco Steel Products Co., San Francisco, through Cahill Brothers, San Francisco, contractor.
- 147 Tons, Berkeley, Cal., buildings at California School for Deaf, to Soule Steel Co., San Francisco, through K. E. Parker, San Francisco, contractor.
- 143 Tons, Sawyer, Wash., Yakima project (Invitation 13697-A), to Bethlehem Steel Co., San Francisco.
- 135 Tons, Port Chicago, Cal., Central Valley project (Invitation 43103-A), to W. S. Wettenhall Co., San Francisco.
- 104 Tons, Alameda, Cal., Naval Air Base barracks wing (Specification 9549), to Herrick Iron Works, Oakland, Cal., through Johnson, Drake & Piper, Oakland, Cal., contractors.

CANAL ZONE

- 450 Tons, Panama Canal, Government order involving stock lengths, to Carnegie-Illinois Steel Corp., Pittsburgh.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

- 1500 Tons, South Boston, Mass., Navy quay and dry dock repairs.
- 1500 Tons, Hartford, Conn., Park river conduit and dike.
- 800 Tons, New Bedford, Mass., South housing project.
- 700 Tons, Niagara Falls, N. Y., superstructure, Rainbow Bridge; bids March 20.

- 600 Tons, Baltimore, McCullough Homes; bids March 27.
- 200 Tons, Harrisburg, Pa., housing project; Berwick Lumber & Supply Co., Berwick, Pa., contractor.
- 150 Tons, Providence, R. I., and Salem, Mass., municipal projects, split two ways.
- 100 Tons, South Boston, Navy shop No. 16.
- 100 Tons, South Boston, Navy yard repairs.
- 100 Tons, Birch Hill, Mass., Millers River dam.

CENTRAL STATES

- 975 Tons, Chicago, Wesley Memorial Hospital; bids in.
- 730 Tons, Piedmont, Mo., Clearwater reservoir for U. S. Engineers.
- 394 Tons, Chicago, Customs Building; Coath & Goss, Inc., Chicago, contractor.
- 359 Tons, Lansing, Mich., for Treasury Department, Procurement Division.
- 350 Tons, Chicago, subway station, section S-10-A; bids March 21.
- 350 Tons, Painesville, Ohio, plant addition, Industrial Rayon Corp.; bids March 15.
- 300 Tons, Decatur, Ill., storage tanks for Spencer-Kellogg.
- 239 Tons, Nelson and Hardin Counties, Ky., State highway project; bids March 22.
- 200 Tons, Chicago, W. C. Ritchie Co. box factory.
- 175 Tons, Akron, Ohio, Elizabeth Park housing project; Lloyd Builders, Chicago, low bidder.
- 160 Tons, Painesville, Ohio, Industrial Rayon plant.
- 150 Tons, State of Arkansas, highway bridges; bids March 14.
- 140 Tons, Cleveland, County bridge at Bulkley Boulevard and West 40th Street; bids April 2.
- 120 Tons, Champaign, Ill., storage tanks for Swift & Co.
- 100 Tons, Saginaw, Mich., public opening for city; bids taken March 12.
- 100 Tons, Cleveland, State bridge at intersection of Lake, Clifton and Bulkley Boulevards.
- 100 Tons, Neenah, Wis., Kimberly-Clark building; Cecil Construction Co., Milwaukee, contractor.

WESTERN STATES

- 400 Tons, Los Angeles, Los Angeles River improvement, Section VI; bids about April 19.
- 250 Tons, Odair, Wash., Grand Coulee Dam (Invitation 38162); bids in.
- 125 Tons, Kettle Falls, Wash., Bureau of Reclamation (Invitation B-38177-A); bids March 15.
- 110 Tons, Oakland, Cal., Piedmont Avenue school; Peter Sartorio, low bidder on general contract.
- 108 Tons, Cody, Wyo., Shoshone Project (Invitation 48272-A); bids in.

CANAL ZONE

- 7300 Tons, Panama Canal, Pacific and Atlantic sectors, barracks; Tucker McClure, Cristobal, C. Z., low bidder on general contract.

CAST IRON PIPE

Water District No. 6, near Kansas City, Mo., care of Frank Rope, Fidelity Building, Kansas City, attorney and representative, has engaged E. T. Archer & Co., New England Building, Kansas City, consulting engineers, to make surveys for pipe line system for water supply in district, extending south to Eighty-ninth Street from southern city limits, west from Wornall and east to Blue River. Cost about \$150,000. Financing will be arranged through Federal aid.

Cottage Grove, Wis., will ask bids early in April for pipe lines for water system and other waterworks equipment, including valves, hydrants, etc. Cost about \$39,550. Financing has been arranged through Federal aid. General Engineering Co., Portage, Wis., is consulting engineer.

Jonesville, N. C., plans pipe lines for water system and other waterworks installation. Fund of about \$134,000 is being arranged for this and sewage system.

Rahway, N. J., plans pipe line extensions and replacements in water system, and other waterworks installation. Cost about \$200,000. Edwin C. Eller, 31 Doris Parkway, Westfield, N. J., is engineer.

Ellwood City Consolidated Water Co., Ellwood City, Pa., plans pipe line extensions in water system in Cherry Hill and Wiley Hill districts, Sewickley Township, near city.

Lakewood, N. Y., plans pipe line extensions

in water system. Cost about \$25,000. Hill & Hill, 24 Main Street, North East, Pa., are consulting engineers.

Kulm, N. D., plans pipe lines for water system and other waterworks installation. Cost about \$100,000, of which \$35,000 will be represented by a bond issue, recently voted, and remainder secured through Federal aid.

Fall River, Wis., plans water pipe lines and other waterworks installation. Fund of about \$56,000 is being arranged for this and sewage system, of which \$25,000 will be a bond issue, to be voted at special election early in April, and remainder secured through Federal aid. General Engineering Co., Portage, Wis., is consulting engineer.

Department of Purchases and Supplies, Kansas City, Mo., has let contract to U. S. Pipe & Foundry Co., for 10,500 ft. of 16-in. centrifugally cast water pipe, in 18-ft. lengths, and 10,000 ft. of 12-in., in 16-ft. lengths; also award to American Cast Iron Pipe Co., for 10,000 ft. of 12-in., in 16-ft. lengths; all f.o.b. city on certain switch tracks.

Spokane, Wash., has awarded 772 tons of 6, 10, and 12-in. pipe to United States Pipe & Foundry Co., San Francisco, and 220 tons of 8-in. pipe to Pacific States Cast Iron Pipe Co., Provo, Utah.

J. & L. Ingot Output

Averaged 60% in 1939

PITTSBURGH—Jones & Laughlin Steel Corp., in 1939, operated at an average rate of approximately 60 per cent of its steel ingot capacity compared with 37 per cent in 1938 but during the first eight months of 1939 the company's average ingot rate was only 50 per cent of its steel ingot capacity, according to H. E. Lewis, chairman.

For 1939 the company reported a net profit of \$3,188,944 compared with a net loss of \$5,879,958 in 1938. Of the total net profit earned in 1939, \$2,907,755 resulted from operations in the fourth quarter. The smaller showing resulting from operations in the first nine months was due to comparatively low rates of operations as well as unsatisfactory prices, according to Mr. Lewis.

In 1939 gross sales amounted to \$113,323,602 compared with \$75,410,901 in 1938.

Commenting on taxes, Mr. Lewis said, "The total taxes for the year 1939 amounted to 13 per cent of the total payroll of the corporation, as compared with 12.8 per cent of the total payroll in 1938. . . . Total taxes for 1939 amounting to \$5,797,715 are equivalent to \$9.87 a share on the outstanding 7 per cent cumulative preferred stock of the corporation."

Average number of employees in 1939 was 27,307 compared with 26,286 in 1938. Total payroll in 1939 was \$44,491,746 compared with \$34,162,748 in 1938.

Expenditures in 1939 for maintenance and replacements amounted to \$14,245,828 compared with \$10,762,693 in 1938.

Machine "Balance" Tax Urged by O'Mahoney

WASHINGTON—Senator Joseph C. O'Mahoney, who as chairman of the Temporary National Economic Committee will preside at hearings when the committee takes up the subject of technological developments, has introduced a bill in Congress to "balance men and machines" and to relieve unemployment by rewarding employers with credits on tax payments for providing jobs.

The measure, according to the Senator, is proposed on the theory that "the machine could be made to pay its way in terms of human production in such a manner that society would receive the maximum benefits from the full enjoyment of both."

Designed to place a "labor differential tax" on all products, the bill would amend the Internal Revenue Code. Labor differential income is designated as the gross income as defined in Section 22a of the code, less the deductions proposed to be allowed in the bill. In computing labor differential income, the producer under the terms of the bill would be allowed these deductions:

1. The total cost of materials and supplies purchased and used during the taxable year in carrying on production;

2. The total amount of remuneration up to \$3,000 paid as salary or wages for personal services to any worker.

While the Senator emphasized that the measure was tentative in form, he said he would ask a prompt hearing before the House Ways and Means Committee. John W. McCormack, Democrat of Massachusetts, is expected to sponsor an identical measure in the House.

Pittsburgh Steel Showed Gain in 1939

PITTSBURGH—New business in January and February dropped to a rate considerably under that of the fourth quarter but there are indications that the rates of consumption and production of steel are in better balance than in the last quarter of 1939, according to Henry A. Roemer, president, Pittsburgh Steel Co. In presenting the company's annual report for 1939 he added that incoming orders should show an improvement beginning with the current month.

Pittsburgh Steel operated at 64.7 per cent of ingot capacity in 1939. The

company's net profit for 1939 amounted to \$564,870, compared with a net loss of \$488,423 in 1938. Total net sales in 1939 amounted to \$28,570,638 compared with \$20,827,882 in 1938.

While the company's rated ingot capacity in 1936 was 720,000 gross tons a year, improvement of open-hearth furnaces and introduction of more efficient methods since that time have made possible a current annual ingot capacity of 960,000 gross tons.

New Small Combine For 10 to 50 Acre Farms

CHICAGO — The International Harvester Co. this week introduced a new small combine of 4-ft. cut to sell for \$405 f.o.b. factory. This combine, which is the smallest and lowest in price ever manufactured by the company, will be produced at the East Moline, Ill., works. Weighing only 1900 lb., as compared with other models weighing from 3500 to 7500 lb. the new model A was developed primarily for farms of 10 to 50 acres. A turret-shaped top and sides creates a streamlined effect.

February Construction Highest Since 1929

AWARDS of contracts for heavy engineering construction in February totaled \$270,928,000, the highest level for any February since 1929 and the second highest of record, according to *Engineering News-Record*. The average weekly figure for February is \$54,186,000, a 13 per cent increase over the January weekly average and 6 per cent higher than the average for February, 1939.

Private construction awards in February, on a weekly average basis, top the preceding month by 38 per cent and are 16 per cent above a year ago. Public construction in the month receded 2 per cent from average of January and 1½ per cent from February, 1939.

Wage Hearing Scheduled

WASHINGTON — Scheduled to be argued before the Supreme Court some time during the week beginning March 25 will be the Lukens Steel Case, in which that company and six other small independent steel mills in the East charge that the Secretary of Labor exceeded her authority in attempting to subject Eastern mills to a minimum wage rate of 62½c. under the Walsh-Healey Public Contracts Act. The Court of Appeals for the District of Columbia sustained the

contention of the steel companies last October and the government appealed the case to the Supreme Court.

Steel Exports Gain Slightly in January

JANUARY iron and steel exports of 396,064 gross tons, valued at \$31,153,365, topped those of December, 1939 (394,035 tons valued at \$30,099,593), by the narrow margins of 2029 tons and \$1,053,772, preliminary figures released by the Bureau of Foreign and Domestic Commerce reveal. In January, 1939, the trade in these same products had amounted to 134,788 tons valued at \$10,214,547.

Shipments to European buyers rose from 72,657 tons in December, 1939, to 109,957 tons in January largely because of increased purchases by the United Kingdom, the Netherlands, and Norway. The trade with South America was slightly higher at 110,657 tons than that of December, 109,455 tons, with increased shipments to Argentina and Brazil offsetting reductions in the trade with Colombia, Peru, and Venezuela.

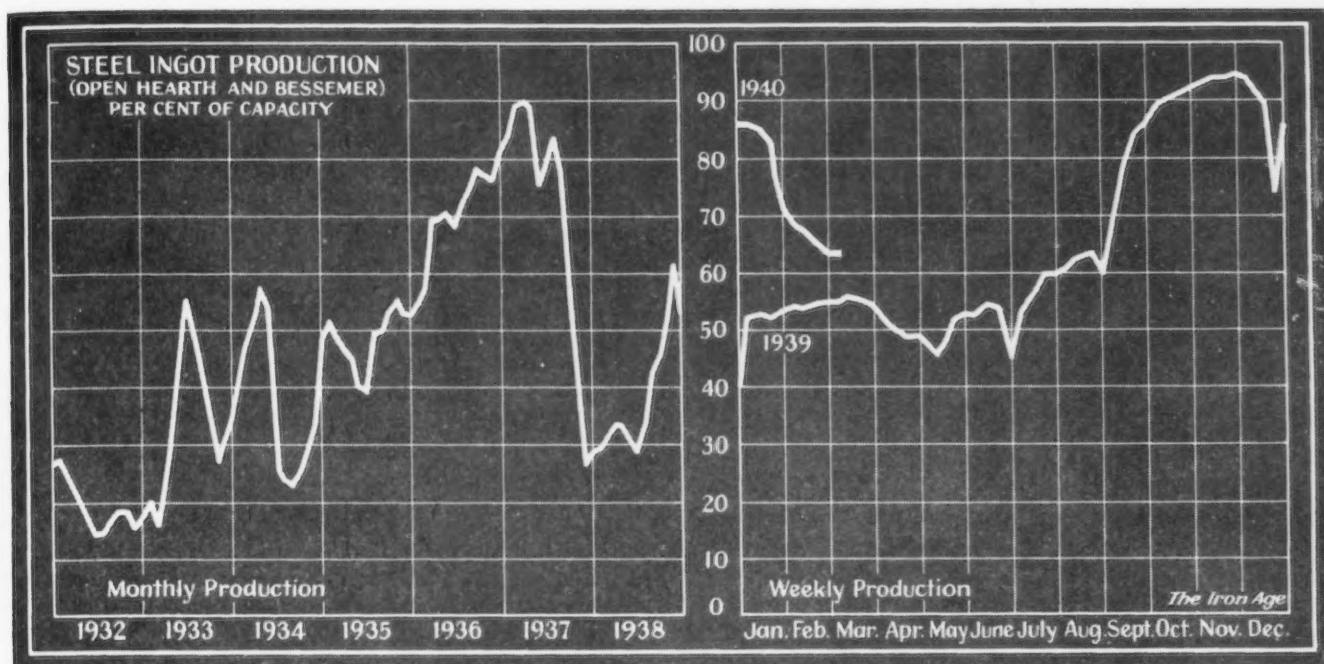
Leading individual markets in January were the United Kingdom, 45,675 tons against but 22,020 tons in December; Canada, 43,966 tons against 50,504 tons; Argentina, 37,735 tons against 30,396 tons; Japan, 26,623 tons against 47,675 tons; and Brazil, 24,113 tons against 22,643 tons.

Exports of scrap from the U. S. in January totaled 187,457 gross tons in comparison with 206,402 tons shipped in December, 1939, and 227,884 tons in January, 1939. January exports were valued at \$3,567,221 against a value of \$4,064,358 for December and \$3,351,351 for January, 1939.

Italy Will Develop Deposits of Magnesite

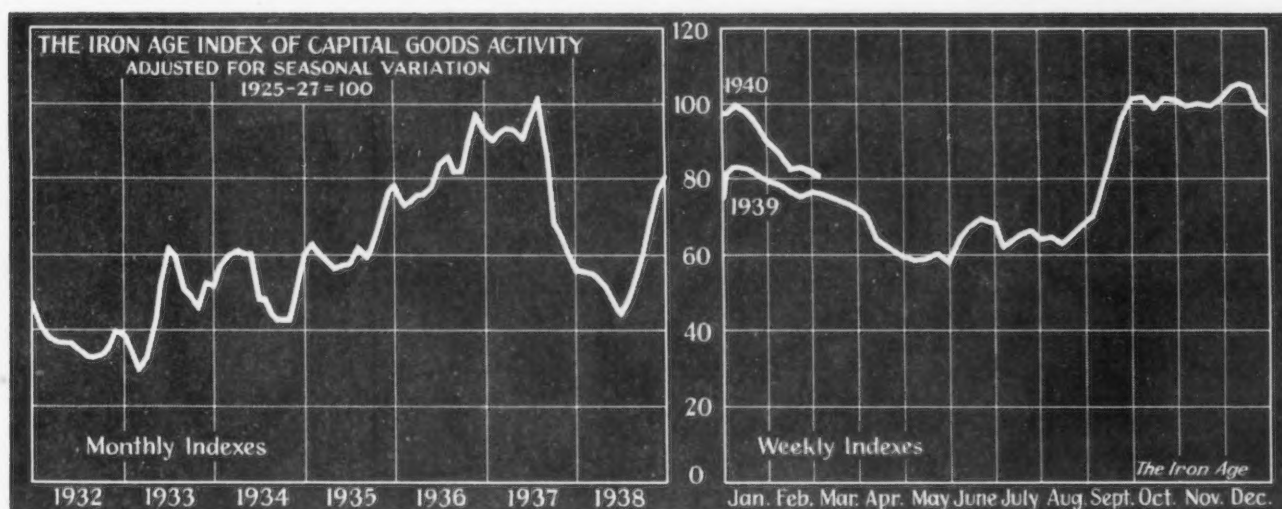
WASHINGTON — Exploitation of extensive deposits of magnesite in the Dolomite mountains in Northern Italy is expected by Italian authorities to result in the annual production of approximately 6000 tons of magnesium by 1941, says a report received from Consul Lester L. Schnare, Milan. Up to this time Italian output of this metal has been insignificant, amounting to only 100 tons in 1938. Practically the only mines from which the ores containing this metal were taken in former years were in Sardinia. These Sardinian mines are now reported to have been abandoned as too expensive for further development.

Ingot Rate Remains at 63½% of Capacity



District Ingot Production, Per Cent of Capacity	Pittsburgh	Chicago	Valleys	Philadelphia	Cleveland	Buffalo	Wheeling	Detroit	Southern	S. Ohio	Western	St. Louis	Eastern	Aggregate
CURRENT WEEK..	56.0	59.0	48.0	63.0	72.0	51.5	82.0	82.5	80.0	55.0	70.0	61.5	90.0	63.5
PREVIOUS WEEK..	62.0	60.0	44.0	61.0	71.0	56.5	84.0	82.5	80.0	51.0	70.0	63.0	50.0	63.5

Capital Goods Index Recedes 1½ Points to 80%



A FURTHER contraseasonal decline was recorded by THE IRON AGE index of capital goods activity in the week ended March 9, bringing the index down to 80 from 81.5 in the preceding week. This new loss brings the index to the lowest point reached since the week of Sept. 16, 1939. The week's loss was again due primarily to the failure of the physical output of the heavy industries represented in the index to gain in keeping with seasonal trends. Thus, while actual automobile production was slightly higher, the improvement was not to the degree usually experienced at this time of the year and consequently the index number of this series showed a loss for the week after seasonal correction. The gain in lumber carloadings is partially a reflection of the ex-

pected rebound from the holiday week dip, as this series lags one week behind the other components.

	Week Ended Mar. 9	Week Ended Mar. 2	Comparable Week	
			1939	1929
Steel ingot production ¹	82.4	85.1	72.3	118.9
Automobile production ²	103.2	103.8	83.8	131.6
Construction contracts ³	62.8	64.6	101.8	133.5
Forest products carloadings ⁴	59.0	58.2	44.8	122.4
Production and shipments, Pittsburgh District ⁵	92.8	95.6	72.9	116.4
Combined index	80.0	81.5	75.1	124.6

Sources: ¹ THE IRON AGE; ² Ward's Automotive Reports; ³ Engineering News-Record; ⁴ Association of American Railroads; ⁵ University of Pittsburgh. The indexes of forest products carloadings and activity in the Pittsburgh area reflect conditions as of the week ending March 2. Other indexes cover the week of March 9.

... SUMMARY OF THE WEEK ...

... Ingot output decline lasting eight weeks is checked at 63½ per cent level.

• • •

... Exports increase, but domestic market for steel continues spotty.

• • •

... Scrap composite, indicating a leveling off, again holds at \$16.71.

HEAVER export business coupled with spotty improvement in the domestic market for steel this week was sufficient to check the decline in steel operations which had lasted through eight consecutive weeks and had reduced the industry's ingot rate by 22½ points since early January.

The week's steel production rate of 63½ per cent, unchanged from last week, clearly faces further testing as to the ability of mill schedules to hold and a considerable increase in demand is needed to prevent the production rate from slipping back to the 59 per cent rate which prevailed in early September at the outbreak of the European war.

Five steel-making areas report gains in ingot production, these being Youngstown, up four points to 48 per cent; Cleveland, one point to 72 per cent; southern Ohio River, four points to 55 per cent; Eastern, 40 points to 90 per cent, and Philadelphia, two points to 63 per cent. Other districts, including some of the most important, reported weaker mill schedules, Pittsburgh being down six points to 56 per cent; Chicago, one point to 59 per cent; Buffalo, five points to 51½ per cent; Wheeling-Weirton, two points to 82, and St. Louis, 1½ points to 61½ per cent.

WHILE steel bookings the past week continued the leveling-off process which began in late February, the steel sales picture is not without some bright spots. Merchant pipe for construction work and material for agricultural implements are in demand and the aircraft and machinery industries are taking considerably greater tonnages of alloy steels. Automobile parts plants are releasing in volume. The steadiest flow of orders in the past 10 days, however, has come from abroad, particularly Scandinavia and South America, and some industrialists are again weighing the possibility of the export steel market developing later in the year so rapidly as to have repercussions on domestic business.

Expansion in exports sales staffs of some steel companies is evidence of the increased interest in sales

abroad which, however, are complicated by a shortage of ship space, by a tendency of foreign buyers to press for lower prices because of the relative slackness of the domestic market and by the continued activity of British and other European sellers in world markets. January iron and steel exports from the United States totaled 396,064 tons, compared with 394,035 tons in December, 1939, and 134,788 tons in January, 1939. A growing factor in United States exports is Canada which is operating its steel plants at a new peak, but is being forced in turn to this country for material such as plates.

REAFFIRMATION last week of prices for the second quarter has had little effect on steel buying since such action had been expected. Pig iron producers have opened their second quarter books at current prices without formal announcement. Since no mention was made of manufacturers' wire in the recent second quarter announcement by the leading producer, adoption of a spot basis on that item is looked for. Concrete bar prices are reported somewhat softer than a week ago.

Meanwhile the scrap market continues to hold and for the fourth week THE IRON AGE composite price for No. 1 heavy melting steel is \$16.71. For the first time in many weeks elements of strength are seen in the scrap market and a mill purchase in the Chicago area was made at the top of the range quoted the week before.

Steel ingot production in February totaled 4,374,625 net tons, compared with 5,619,689 tons in January, the decline being attributed partly to the shorter month, according to the American Iron & Steel Institute. However, the weekly average of 1,056,673 net tons of ingots produced during February was 17 per cent less than the January average of 1,268,555 net tons. During February the steel industry operated at an average of 69.62 per cent of capacity, contrasted with 83.58 per cent last January and 54.72 per cent in February, 1939.

PURCHASES of motive power equipment continue to highlight the railroad market, with the Atchison, Topeka, and Santa Fe ordering four Diesel-electric passenger locomotives, and the Lehigh Valley placing contracts for four such units. Iranian State Railways are seeking bids on 12 to 24 locomotives.

Fabricated structural steel awards the past week dropped to 9900 tons from 36,100 tons the preceding week, the only sizable contract being 1960 tons for a Borough Hall at Kew Gardens, N. Y., and 1375 tons for a building at Vancouver, Wash., for the Aluminum Co. of America. Reinforcing steel lettings totaled 9450 tons, compared with 9950 tons last week, and included 1175 tons for an approach to the Queens-New York midtown tunnel.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Rails and Semi-finished Steel

Per Gross Ton:	Mar. 12, 1940	Mar. 5, 1940	Feb. 13, 1940	Mar. 14, 1939
Rails, heavy, at mill	\$40.00	\$40.00	\$40.00	\$40.00
Light rails: Pittsburgh, Chicago, Birmingham	40.00	40.00	40.00	40.00
Rerolling billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	34.00
Sheet bars: Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point	34.00	34.00	34.00	34.00
Slabs: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	34.00
Forging billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham	40.00	40.00	40.00	40.00
Wire rods: Nos. 5 to 9/32 in., Pittsburgh, Chicago, Cleveland, cents per lb.	2.00	2.00	2.00	1.92
Skelp, grvd. steel: Pittsburgh, Chicago, Youngstown, Coatesville, Sparrows Point, cents per lb.	1.90	1.90	1.90	1.90

Finished Steel

Cents Per Lb.:	Mar. 12, 1940	Mar. 5, 1940	Feb. 13, 1940	Mar. 14, 1939
Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.15	2.15	2.15	2.25
Plates: Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont	2.10	2.10	2.10	2.10
Structural shapes: Pittsburgh, Chicago, Gary, Buffalo, Bethlehem, Birmingham	2.10	2.10	2.10	2.10
Alloy bars: Pittsburgh, Buffalo, Bethlehem, Massillon or Canton	2.70	2.70	2.70	2.80
Cold finished bars: Pittsburgh, Buffalo, Cleveland, Chicago, Gary	2.65	2.65	2.65	2.70
Hot rolled strip: Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown, Birmingham	2.10	2.10	2.10	2.15
Cold rolled strip: Pittsburgh, Cleveland, Youngstown	2.80	2.80	2.80	2.95
Sheets, galv., No. 24: Pittsburgh, Gary, Sparrows Point, Buffalo, Middletown, Youngstown, Birmingham	3.50	3.50	3.50	3.50
Hot rolled sheets: Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown	2.10	2.10	2.10	2.15
Cold rolled sheets: Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown	3.05	3.05	3.05	3.20

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

The Iron Age Composite Prices

Finished Steel

Mar. 12, 1940	2.261c. a Lb.
One week ago	2.261
One month ago	2.261
One year ago	2.286

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

High	Low
1940.....	2.286c., Jan. 3; 2.236c., May 16
1939.....	2.512c., May 17; 2.211c., Oct. 18
1938.....	2.512c., Mar. 9; 2.249c., Jan. 4
1937.....	2.249c., Dec. 28; 2.016c., Mar. 10
1936.....	2.062c., Oct. 1; 2.056c., Jan. 8
1935.....	2.118c., Apr. 24; 1.945c., Jan. 2
1934.....	1.953c., Oct. 3; 1.792c., May 2
1933.....	1.915c., Sept. 6; 1.870c., Mar. 15
1932.....	1.981c., Jan. 13; 1.883c., Dec. 29
1931.....	2.192c., Jan. 7; 1.962c., Dec. 9
1930.....	2.236c., May 28; 2.192c., Oct. 29
1929.....	

Pig Iron

\$22.61 a Gross Ton
22.61
22.61
20.61

Based on average for basic iron at Valley furnace and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

High	Low
\$22.61, Sept. 19;	\$20.61, Sept. 12
23.25, June 21;	19.61, July 6
23.25, Mar. 9;	20.25, Feb. 16
19.73, Nov. 24;	18.73, Aug. 11
18.84, Nov. 5;	17.83, May 14
17.90, May 1;	16.90, Jan. 27
16.90, Dec. 5;	13.56, Jan. 3
14.81, Jan. 5;	13.56, Dec. 6
15.90, Jan. 6;	14.79, Dec. 15
18.21, Jan. 7;	15.90, Dec. 16
18.71, May 14;	18.21, Dec. 17

Steel Scrap

\$16.71 a Gross Ton
16.71
17.33
15.08

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

High	Low
\$17.67, Jan. 2;	\$16.71, Feb. 20
22.50, Oct. 3;	14.08, May 16
15.00, Nov. 23;	11.00, June 7
21.92, Mar. 30;	12.92, Nov. 10
17.75, Dec. 21;	12.67, June 9
13.42, Dec. 10;	10.33, Apr. 29
13.00, Mar. 13;	9.50, Sept. 25
12.25, Aug. 8;	6.75, Jan. 3
8.50, Jan. 12;	6.43, July 5
11.33, Jan. 6;	8.50, Dec. 29
15.00, Feb. 18;	11.25, Dec. 9
17.58, Jan. 29;	14.08, Dec. 3

... THIS WEEK'S MARKET NEWS ...

OPERATIONS

... Output holds at 63.5% after declining eight weeks

STEEL plant operations held unchanged this week a 63½ per cent, thereby breaking an eight-week decline which brought the operating rate down 22½ points.

Advances of four points to 48 per cent were reported for YOUNGSTOWN, two points to 63 per cent for PHILADELPHIA, one point to 72 per cent for CLEVELAND, four points to 55 per cent for SOUTHERN OHIO RIVER, and 40 points for the EASTERN area. These gains offset weaker mill schedules at PITTSBURGH, off six points to 56 per cent, CHICAGO, off one point to 59 per cent, BUFFALO, five points to 51½ per cent, WHEELING off two points to 82 per cent, and St. LOUIS down one and one-half points to 61½ per cent.

NEW BUSINESS

... Export orders rise, domestic business still leveling off

INCOMING business of CLEVELAND steel producers so far this month remains ahead of the corresponding February period and is on a more substantial basis. At the start of this week, spring seasonal buying appeared to be heavier, particularly in merchant pipe for construction work and material for the agricultural trade. Alloy steels continue in the spotlight with greatest pressure coming from the aircraft and machinery fields. Auto parts plants are releasing steel steadily. Most consumers desire quick shipments.

Probably the steadiest flow of orders recently has been provided by export markets particularly Scandinavia and South America. Activity of British and other European steel sellers continues strong in world markets and in a number of recent instances orders have been closed by these sellers under terms more advantageous to the buyer than American mills could offer.

Total bookings at PITTSBURGH in the past week are about on a par with the average of the previous three

weeks. The slight betterment which had appeared a week ago has not carried through but there has been further improvement in the volume of export buying. As reported before, March is expected to reflect continuation of the leveling off process in the amount of incoming business. Some strength, however, has appeared in structural inquiries and awards.

Volume of new orders in the CHICAGO district is about equal to that of a week ago, the general level of incoming business continuing between 35 and 45 per cent of capacity. As predicted last week, operations at some mills have fallen because of decreasing backlogs and no comparable improvement in new tonnage. Among sellers a certain amount of optimism still prevails, however, and several are expecting a pronounced upward turn by April 1. It is regarded as fairly certain that consumers as a group are using more steel than they are taking in, which belief gives rise to the general opinion that a widespread spring improvement will immediately be reflected in higher mill operations.

Manufacturing activities of major farm equipment plants in the CHICAGO area have lessened somewhat in recent weeks, but generally production is still high. Farm authorities are predicting a higher farm income the first six months of 1940 than for the comparable period last year. Since farm tractor and implement sales are keyed directly to farm income the realization of this prophecy should be of benefit to Mid-west steel producers.

Chicago steel warehouse sales in February improved slightly when compared with January, and March is expected to show a further betterment. A wide diversity of products and customers is reported. Can producers indicate a 15 per cent improvement in sales nationally over a year ago. As long as railroad earnings continue favorable, prospects are good for further additions to rolling stock and repairs to roadbeds, but so far in 1940 little interest in this equipment has been shown by the carriers.

New bookings in the PHILADELPHIA area showed a slight improvement in the past week, but generally the gain

was limited to sellers with widely diversified lines. Sales there still reflect a widely diversified demand, with no one outlet particularly active at the moment. The present volume of incoming business in Philadelphia is barely equal to 45 per cent of capacity. Buying by plants holding government contracts is accounting for a large share of present business. Production of gun mounts, tanks, light cannons and various United States naval work is engaging a large part of the district's plant capacity. A district shipyard, which recently booked two light cruisers, is expected to place the required steel this week. Approximately 7500 tons of steel will be needed, of which about 4500 tons will be plain carbon grades. The unsettled price situation is restricting export business.

PRICES

... Spot quotations may be applied to manufacturers' wire

COMMODITY and cold-rolled strip and wire rods will be carried into the second quarter unchanged in price, according to announcements late last week. Manufacturers' wire prices are unchanged but were not specifically mentioned in the announcement of the leading producer, which omission indicates the possibility of elimination of the quarterly announcement basis and adoption of spot prices. Merchant wire products were placed on spot basis some months ago. Tubular goods producers dropped quarterly announcements several years ago.

Pig iron producers are accepting second quarter business at today's price levels.

Major steel prices continue firm with the exception of concrete bar quotations which are definitely softer than they were a week ago.

CHICAGO steel warehouses have reduced the base price of galvanized sheets 25c. a 100 lb. to \$4.60. In quantities from 1500 to 3499 lb., a further reduction of 25c. has been made, and in quantities of 3500 lb. and more, a reduction of 40c. a 100 lb. Ware-

houses introduced revised cutting and shearing extras on all sizes and types of bars early this week. The old practice of charging for 100 lb. lots, has been discontinued in favor of a charge per piece, with a sliding scale downward, benefiting the large buyer.

PIG IRON

... Second quarter books opened with prices unchanged

WHILE leading producers have opened books for the second quarter at unchanged prices, the volume of domestic orders continues little changed. Some sellers report that March tonnage may top February but improvement is spotty. The export market continues active and a fair number of contracts of from 1000 to 2000 tons have been placed but an acute shortage of ship space is developing.

New business at PITTSBURGH continues slow and shipments are off from a month ago. There are 33 blast furnaces in operation in the PITTSBURGH area out of 50 available stacks.

With hand-to-mouth buying replacing forward commitments, activity of CLEVELAND sellers continues at a reduced level. The blast furnace enlargement program undertaken by one Ohio producer will probably make available additional merchant iron.

Foundry melt in CHICAGO is virtually unchanged from the level of the past several weeks, based on the movement of foundry coke. Pig iron shipments still are lagging and sellers are not hopeful for improvement until April. March is expected to show only a slight increase in activity over February. Export inquiries are being received here as elsewhere, but little tonnage has been accepted.

A few small orders have been booked for second quarter delivery at unchanged prices in the PHILADELPHIA district, but buyers are wary of making forward commitments, due partly to the fact that there still remains substantial unshipped tonnages on old contracts. Inquiry for castings in the Philadelphia area is showing improvement, but this has not as yet been reflected in better selling schedules.

Melters in SOUTHERN OHIO continue to resist substantial iron commitments although they are accepting shipments on old orders at good rate. Small orders are reported, but these are chiefly to cover urgencies. The melt is unchanged, with stove foundries

dries unseasonably slow. At BUFFALO the Bethlehem Steel Co. last week returned to blast a furnace which had been taken off for repairs, bringing the total active there to five. Merchant iron producers find little change, with shipments running good and foundry operation satisfactory. Reaffirmation of prices for the second quarter had no effect on buying at St. Louis. Shipments against contracts have improved.

STRUCTURAL STEEL

... Awards drop to 9900 tons from 36,106 tons last week

FABRICATED structural steel lettings declined to 9900 tons from 36,100 tons last week. The only sizable awards are 1960 tons for a Borough Hall at Kew Gardens, N. Y., and 1375 tons for buildings at Vancouver, Wash., for the Aluminum Co. of America.

Structural steel projects at 11,600 tons are slightly higher than a week ago. The bulk of new inquiries is in small lots, the only large new jobs reported being 2200 tons for a plant at Belleville, N. J., for the Andrews Jergens Co., and 2000 tons for furnace building extensions and a trestle for the International Harvester Co. at South Chicago.

Structural specifications at PITTSBURGH continue to level off and deliveries are fairly prompt. Increased inquiries in the past week, however, seem to indicate a reawakening in structural projects. No large awards were made or new projects noted on the WEST COAST during the week. Bethlehem Steel Co. took 1042 tons of sheet piling for improvement of the Los Angeles River.

WAREHOUSE BUSINESS

... Seasonal demand develops in East for some items

APPROACH of spring and the accompanying increase in outdoor building activity has brought out a little better demand for warehouse items in the New York area in the past 10 days. However, sales volume in February showed little improvement over the January volume, but was substantially above February a year ago.

February sales reflected a diversified demand, with specialties relatively most active. Export business has shrunk considerably since prompt mill shipments have become available, but

a fairly active export demand still exists for alloys and other specialties on which mill shipments are still somewhat tardy.

Price weakness on sheets early in the month resulted in the establishing of new prices on both black and galvanized sheets. Black sheets are now generally quoted at 3.43c. per lb. and galvanized sheets at 4.50c. per lb., in all quantity brackets. One large interest, however, is quoting the 3.43c. price only on quantities of 2000 lb. and over. Common wire nails are now priced at \$2.85 per keg in 25 keg lots, a decline of 15c. from the previously published price.

TUBULAR GOODS

... Pipe demand slightly stronger at Pittsburgh

PIPE demand at PITTSBURGH in the aggregate is running slightly stronger than a month ago. Increased volume is noted in standard pipe sales, oil country goods, and, to a slight extent, boiler tubes. Line pipe bookings are about on a par with a month ago. No definite indication of an upward movement in sales volume, however, is present yet.

RAILROAD BUYING

... Atchison buys four diesel-electric locomotives

DOMESTIC equipment purchases in February totaled 18 locomotives, 1172 freight cars and 15 passenger-train cars, as compared with 28 locomotives, 209 freight cars and five passenger-train cars in January, and three locomotives and 2004 freight cars in February, 1939, *Railway Age* reports. At the close of February purchases of 52 locomotives, 3240 freight cars and 62 passenger-train cars were pending.

Purchases of motive power equipment continue to be the outstanding feature of the railroad market. Recent purchases of this nature reported in the past week include four diesel-electric passenger locomotives placed with Electro-Motive Corp. by Atchison, Topeka & Santa Fe and four diesel-electrics for Lehigh Valley. Three of this latter order went to Electro-Motive Corp. and one was awarded to American Locomotive Co. Iranian State Railways are seeking bids on 12 to 24 locomotives of the 2-8-2 or 2-10-2 type. Tennessee Copper Co. has placed eight air-dump

cars with Pressed Steel Co. Long Island Railroad is rebuilding 96 World's Fair shuttle cars at its Jamaica, N. Y. shops, and St. Louis Public Service is inquiring for 100 buses using engines and drives of the gas-electric, diesel-electric, or diesel-hydraulic types.

The first stainless steel railroad cars to be built in this country for export are now under construction in the Philadelphia shops of E. G. Budd Mfg. Co. This order consists of 28 lightweight passenger cars for the Portuguese National Railway and are scheduled to be delivered in early summer.

BOLTS, NUTS AND RIVETS

... Rivet producers report gains, bolt and nut market spotty

NEW business for rivet producers at CLEVELAND has improved sharply during the past week as a result of government awards. Bolt and nut manufacturers report the improvement which commenced in February is continuing this month and it is anticipated volume will increase farther in March and April. With some consumers' inventories near exhaustion, buying is on a more substantial basis. Farm implement sales have been light but the break-up of the severe winter is expected to release agricultural buying. Bolt, nut and rivet and cap screw manufacturers are expected to open their books for second quarter with prices unchanged.

Additional bolt and nut makers at PITTSBURGH have followed the recent revisions in the small rivet lists. Incoming business at PITTSBURGH still reflects a leveling-off process but no important pickup is in sight as yet. Plants are still working on railroad backlogs.

REINFORCING BARS

... 1175-ton tunnel award goes to Jones & Laughlin

REINFORCING steel awards call for 9450 tons and include 1175 tons in Queens, N. Y., for an approach to the Queens-New York Midtown tunnel, the latter tonnage going to Jones & Laughlin Steel Corp. through Fireproof Products, Inc.

New reinforcing steel projects are in good volume at 14,700 tons, with the bulk in small lots. The only large inquiries are 1500 tons at South Bos-

ton for a Navy quay and dock repairs, and 1500 tons at Hartford, Conn., for a Park river conduit and dike.

Bids are closing this week on 6200 tons of bars for Army officers' quarters at Panama Canal. A substantial increase in inquiries has materialized in the past week. Concrete bar prices have become steadily weaker in the past 10 days and for the time being at least seem to have settled somewhere near a price to contractors of \$1.90 a 100 lb. f.o.b., Pittsburgh, and other equivalent basing points. Whether or not the bottom has been reached in the current flurry of price cutting remains to be seen. The market has become so unsettled that some makers have refused to sell material at or below cost.

WIRE PRODUCTS

... Incoming business continues gain at Cleveland

MANUFACTURERS' wire has been taken off the quarterly price basis and is now on the same spot basis that merchant wire sellers have been following for some months. A few additional changes in manufacturers' wire extras may be made in the near future. Incoming business at CLEVELAND continues to improve. Export sales are well maintained and new inquiry includes a tonnage of plain galvanized wire for Scandinavia. On merchants' wire products the primary market is reported very satisfactory as to prices but trouble is noted here and there in secondary markets. Some distributors apparently have become nervous due to the prolonged cold weather and feel that the farmers may go to the fields without an opportunity to make their customary spring repairs and improvements.

Total wire requirements at PITTSBURGH in the past week have been no greater than a week ago. Usual spring expansion has not yet made an appearance but improvement is confidently looked for soon. Practically all lines of wire and wire products are slow.

Although recent Northern California floods put a crimp in immediate prospects for farm buying, much replacement will be necessary on the WEST COAST.

CHICAGO district orders have fluctuated narrowly in a low plane for some weeks. Manufacturers of automobile springs are operating only four days a week, despite the ex-

treme activity in Detroit. New orders from other industrial consumers are infrequent. The weather through the Middle West has not moderated sufficiently to inspire a buying movement from the rural districts. Farm income is running ahead of a year ago, however, so prospects are good for merchant wire producers.

... PLATES ...

... Export tonnage gains; ship space lacking

SMALL tonnage orders continue to be numerous at CLEVELAND and include material for alterations and repairs on Great Lakes vessels. Bethlehem Steel Co., Bethlehem, Pa., has been awarded 800 tons for a 42-in. municipal pipe line at Toledo. Pittsburgh-Des Moines Steel Co. is reported low on 500 tons for an elevated water tank at Toledo.

Domestic plate demand at PITTSBURGH is no better than a week ago. However, substantial export tonnage has been placed recently and involves upwards of 20,000 tons for a neutral European country. Increased business from abroad, however, is being hampered by lack of bottoms.

While a few PHILADELPHIA sellers experienced a slight improvement in miscellaneous bookings in the past week, others reported a small loss, so that for the district as a whole the week was probably a little below the previous week. There continues to be some sporadic small lot buying by tank and boiler fabricators, warehouses, auto parts makers and the railroads, and occasional releases from the shipyards, but outside of 7500 tons of material, mostly plates, required by a district shipyard, there is no important new business in sight. Export plate inquiry is fairly active, but the unsettled price situation and dearth of ship space is keeping bookings at a minimum.

Plate business in the NEW YORK district is still dragging along at a low pace, and the expected pickup in spring buying has yet to materialize. Tank builders, however, should increase their buying within the next few weeks. The largest single pending item is the steel for the New York Central cars. Domestically prices continue firm, but further weakness has developed in export prices, which are not below the domestic level.

New plate business at CHICAGO is light, as can easily be deduced from

the deliveries mills are quoting of one week to 10 days on both sheared and universal mill plates. Unless large scale railroad buying is resumed soon, or structural fabrication increases substantially, little is in sight for plate mills.

SHEETS AND STRIP

... Demand tapered at Pittsburgh and Cleveland

SHEET and strip demand at PITTSBURGH has turned sluggish in the past week. Total volume of bookings is comparable with those placed just previous to the recent automotive purchases. Miscellaneous demand has failed to expand much if any and continues to reflect day-to-day buying habits.

After a brisk two weeks, paced by automotive requirements, orders and releases at CLEVELAND simmered down starting March 7. On many current orders quick deliveries are requested, indicating good activity on the part of certain manufacturers. American Steel & Wire Co. has reaffirmed present base prices on commodity and cold rolled strip for shipment to and including June 30, 1940, for delivery and consumption in the United States.

New orders for sheets and strip have improved somewhat at CHICAGO mills recently, largely as the result of fairly regular small buys from automobile makers. Major auto buys are expected at almost any time, but the present policy of hand-to-mouth purchasing may be continued, according to Chicago producers.

CHICAGO mills are now quoting 10 days to two weeks on heavy hot-rolled sheets, and four to five weeks on light hot-rolled, flat galvanized and galvanized roofing, iron enameling stock and cold-rolled sheets.

While sheet volume in the NEW YORK area continues at a low level,

some sellers report bookings and shipments for the first 10 days well above the comparable February period. Some of this increase in shipments is attributable to deferred releases, originally scheduled for late January and early February. A few substantial inquiries for hot rolled sheets are pending, one of them about 350 tons of drum steel for an oil company. Much export business is being figured, but the amount of business obtained by many sellers is not commensurate with the extra effort involved in quoting in unfamiliar terms.

A small improvement in the sheet demand, the past week, brought the SOUTHERN OHIO average up a few points above 50 per cent of capacity. Virtually all types are more active, with the sole exception of galvanized sheets. The latter continues to be an outstanding market weakness as jobbers appear to be liquidating inventories while awaiting seasonal demand to materialize. Auto demand is present but not as robust as anticipated.

MERCHANT BARS

... Automotive activity supports demand at Chicago

HOT-ROLLED bar sales at PITTSBURGH compare quite well with the volume of those booked in the like period last month. Deliveries are easier and most mills can give prompt service. Export buying remains a factor. Individual orders are relatively small and, aside from automobile company purchases, day to day purchasing habits are ruling the market. Miscellaneous demand is still influenced by inventory digestion.

Demand for bars from CHICAGO forging plants is largely a reflection of the high rate of operations among automobile plants at Detroit. Inquiry for alloy bars is down this week from last, but additional interest from Detroit is expected next week. New

orders from makers of farm equipment are not numerous but future prospects for this industry are good. Warehouse demand is active. Warehouses at Chicago have established new cutting and shearing extras, the charge now being per piece instead of per 100 lb. Large buyers will be favored by a sliding scale downward.

Aggregate incoming tonnage remains light at CLEVELAND. Requirements of agricultural implement manufacturers are a bright spot. One rivet maker who received a government shipbuilding award placed a respectable order.

SEMI-FINISHED STEEL

... Wire rods in good demand; exports a factor

DEMAND in the past week at PITTSBURGH was about on a par with a week ago. Weekly tonnages have been fluctuating due to periodic purchases by non-integrated steel mills and to the sporadic buying by foreign interests.

Moderate domestic demand for billets is coming from non-integrated steel producers, according to CLEVELAND sellers. Wire rods for export are reported in good demand. American Steel & Wire Co. has reaffirmed its present base on hot-rolled rods for shipment to and including June 30, 1940, for delivery and consumption in the United States.

TIN PLATE

OPERATIONS this week are up two points to 56 per cent, but the increase is not particularly significant. No real improvement in tin plate business is expected much before the middle of April but the volume of specifications is not expected to go much if any below current levels.

Weekly Bookings of Construction Steel

	Week Ended			Year to Date	
	Mar. 12, 1940	Mar. 5, 1940	Feb. 13, 1940	Mar. 14, 1939	1940
Fabricated structural steel awards.....	9,900	36,100	21,760	22,800	183,310
Fabricated plate awards	3,610	170	0	3,705	32,770
Steel sheet piling awards.....	1,045	0	100	180	7,420
Reinforcing bar awards.....	9,450	9,950	11,225	5,150	82,770
Total Letting of Construction Steel...	24,005	46,220	33,085	31,835	306,270

FABRICATED STEEL

... Lettings decline to 9900 tons from 36,100 tons last week ... New projects higher at 11,600 tons ... Plate awards call for 3610 tons.

AWARDS

NORTH ATLANTIC STATES

- 1960 Tons, Kew Gardens, N. Y., Borough Hall, to Harris Structural Steel Co., Plainfield, N. J.
- 750 Tons, New York, repairs to hangar No. 4, North Beach Airport, to Bethlehem Steel Co., Bethlehem, Pa.
- 660 Tons, Oaks, Pa., buildings and extensions for B. F. Goodrich Co., to Bethlehem Steel Co., Bethlehem, Pa.
- 350 Tons, Philadelphia, store for S. S. Kresge Co., to Belmont Iron Works, Philadelphia.
- 305 Tons, Franklin District, Baltimore, bottling plant, to Dietrich Brothers, Baltimore.
- 200 Tons, New York, Community Church of New York, to Weatherly Steel Co., Weatherly, Pa.
- 185 Tons, Wilmington, Del., grandstand, to Belmont Iron Works, Philadelphia.
- 150 Tons, Brooklyn, alterations to Third Avenue station for Brooklyn Edison Co., to Belmont Iron Works, Philadelphia.
- 130 Tons, Middlesex County, N. J., bridges, to American Bridge Co., Pittsburgh.
- 120 Tons, Woodbridge, N. J., Thomas A. Edison bridge, to North American Iron & Steel Co., Brooklyn.
- 115 Tons, Fresh Pond, N. Y., reconstruction of State bridge, 60th Street, to American Bridge Co., Pittsburgh.
- 115 Tons, Queens, N. Y., Collins Avenue bridge, to American Bridge Co., Pittsburgh.
- 105 Tons, Elmira, N. Y., East Avenue bridge, to American Bridge Co., Pittsburgh.
- 100 Tons, Pittsfield, Mass., General Electric Co. unit, to Bethlehem Steel Co., Bethlehem, Pa.

THE SOUTH

- 480 Tons, Hopewell, Va., Solvay Process Co., plant addition, to Virginia Bridge Co., Roanoke, Va.
- 240 Tons, Gravel Switch, Ky., vertical lift bridge over Lock Harbor, for TVA, to Lakeside Bridge & Steel Co., Milwaukee.
- 105 Tons, Paulding County, Ga., bridge, to Virginia Bridge Co., Roanoke, Va.
- 105 Tons, Chickamauga Dam, Tenn., bridge for TVA, to Midland Structural Steel Co., Cicero, Ill.

CENTRAL STATES

- 335 Tons, Springfield, Ohio, Woolworth store, to American Fabricated Steel Co., Philadelphia.
- 300 Tons, Milwaukee, building for Square D Co., to Austin Co., Cleveland.
- 280 Tons, Marion, Ind., bridge, to Pan American Bridge Co., New Castle, Pa.
- 270 Tons, Norristown, Ind., bridge, to Pan American Bridge Co., New Castle, Ind.
- 170 Tons, Ayr, Neb., bridge, to St. Joseph Structural Steel Co., St. Joseph, Mo.
- 115 Tons, Chicago, Rheem Co. store, to Bethlehem Steel Co., Bethlehem, Pa.
- 110 Tons, Pleasant Hill, Ill., State bridge, route 158, section 4-VF, to Midland Structural Steel Co., Cicero, Ill.

WESTERN STATES

- 1375 Tons, Vancouver, Wash., buildings for Aluminum Co. of America, to Bethlehem Steel Co., San Francisco.
- 300 Tons, Los Angeles, Los Angeles River improvement, Section II, bearing piles to Bethlehem Steel Co., Los Angeles, through William T. Loesch, Pasadena, Cal., contractor.
- 275 Tons, Burbank, Cal., Lockheed aircraft assembly building No. 7, to Consolidated Steel Corp., Los Angeles.
- 200 Tons, Portland, Ore., United Airlines hangar, to Bethlehem Steel Co., Portland, Ore.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

- 2200 Tons, Belleville, N. J., manufacturing building for Andrew Jergens Co.
- 570 Tons, Cheektowaga, N. Y., State bridge PSC-4666.
- 550 Tons, New York, ski jumping frame at World's Fair for Ski Cavalcade.
- 500 Tons, Philadelphia, building for Westinghouse Electric & Mfg. Co.; United Engineering Co., general contractor.

- 400 Tons, Philadelphia, building, Friehofer Baking Co., bids in.
- 320 Tons, Schenectady, N. Y., diesel shop extension and leanto for American Locomotive Co.
- 265 Tons, Newark, N. J., skating rink for Victor J. Brown.
- 250 Tons, Philadelphia, 49th Street railroad bridge.
- 240 Tons, Washington, building for Longfellow Building Corp.
- 200 Tons, New York, Green Bay Manor housing project.
- 200 Tons, Albany, N. Y., recreation building for Samuel P. Herkowitz.
- 260 Tons, Elmira, N. Y., additions to buildings for Remington-Rand, Inc.
- 200 Tons, Lawrence County, Pa., State highway bridge.
- 120 Tons, Ithaca, N. Y., store for Montgomery Ward & Co.
- 110 Tons, Southport, Conn., railroad bridge No. 36.42.
- 110 Tons, Bayway, N. J., office building addition, for Standard Oil Co. of N. J.
- 110 Tons, Niles, N. Y., State highway bridge FAGS-SS-40-1.

THE SOUTH

- 550 Tons, Nelson-Hardin County, Ky., State bridge over Salt River.
- 175 Tons, State of Arkansas, highway bridge; bids March 14.

CENTRAL STATES

- 2000 Tons, South Chicago, furnace building extension and trestle, International Harvester Co.
- 350 Tons, Toledo, chemical building for city; J. A. Utley low bidder on general contract.
- 275 Tons, Youngstown, Ohio, mill buildings for General Fireproofing Co.

Late Personals

ALBERT J. BERDIS has been appointed chief engineer at the Irvin works of the Carnegie-Illinois Steel Corp., succeeding EDWIN T. LORIG, who has been promoted to the staff of the corporation's chief engineer at Pittsburgh.

Mr. Berdis, a graduate in electrical engineering from Purdue University, has been associated with subsidiary companies of the United States Steel Corp. since 1929 when he joined the former American Sheet & Tin Plate Co. as a fuel engineer at Gary. He was transferred to Pittsburgh in 1935 and the following year became chief draftsman, construction engineering bureau, of the Carnegie-Illinois company. He worked at the site of Irvin works during its construction and returned to the general engineering office at Pittsburgh a year ago.

Mr. Lorig has been associated with United States Steel Corp. subsidiaries for 22 years, having held various engineering positions with the former American Sheet & Tin Plate Co. and the Carnegie-Illinois company from 1918 to 1937. He became chief engineer of the construction engineering

- 250 Tons, Howe, Ill., repairs, bridge No. 187.11 for New York Central Railroad Co.
- 220 Tons, Fairmont, Ill., State bridge FA-Route 132, section 6-F-1; bids March 15.
- 180 Tons, Cleveland, State bridge at Lake, Clifton and Bulkley Boulevards.
- 180 Tons, Iowa, beam spans for Chicago & North Western Railroad Co.
- 158 Tons, State of Missouri, highway bridge; bids March 27.
- 136 Tons, Cleveland, county bridge at Bulkley Boulevard and West 49th Street; bids April 2.
- 130 Tons, Pottsville, Mich., State bridge.
- 100 Tons, Chicago, addition to Chicago Tribune Building, R. C. Wieboldt Co., Chicago, contractor.

WESTERN STATES

- 340 Tons, Los Angeles, Los Angeles River improvement, Section VI; bids about April 19.

FABRICATED PLATES

AWARDS

- 1880 Tons, Rome, N. Y., 30-in. pipe, to Lock Joint Pipe Co., Ampere, N. J.
- 800 Tons, Toledo, 42-in. pipe for city, to Bethlehem Steel Co., Bethlehem, Pa.
- 685 Tons, Washington, 48-in. water main for Soldier's Home, to Alco Products Co., Dunkirk, N. Y.
- 130 Tons, Texarkana, Tex., water tank, to Pittsburgh-Des Moines Steel Co., Pittsburgh.
- 115 Tons, Fernbank, Ohio, two oil barges for U. S. Engineers, to Equitable Equipment Co.

PENDING PROJECTS

- 500 Tons, Toledo, elevated water tank; Pittsburgh-Des Moines Steel Co., Pittsburgh, low bidder.

SHEET PILING

AWARDS

- 1042 Tons, Los Angeles, Los Angeles River improvement, Downey Road to Atlantic Boulevard, to Bethlehem Steel Co., Los Angeles, through Rohl-Connolly Co., Los Angeles, contractor.

PENDING PROJECTS

- 800 Tons, Cleveland, contract No. 25, Cuyahoga River improvement; Merritt, Chapman & Scott, Meriden, Conn., low bidder.
- Unstated tonnage, Cleveland, contract No. 29, Cut No. 25-C, Cuyahoga River improvement; bids March 21.

division of Carnegie-Illinois in 1937. He supervised construction of Irvin works and has been chief engineer of that place since 1938. He is a graduate of the University of Wisconsin.



J. M. STODDARD, for many years plant superintendent for several companies in the Syracuse district, has been appointed plant superintendent of the Westcott Chuck Co., Oneida, N. Y.

Carnegie-Illinois to Rebuild Furnace at Carrie Works

PITTSBURGH — Carnegie-Illinois Steel Corp. is to completely rebuild, from the foundation up, No. 3 blast furnace at its Carrie works, Rankin, Pa. The rebuilt unit will have an average daily capacity of approximately 1100 net tons, an increase over the old unit which was last rebuilt in 1927. Provision has also been made for improved gas washing equipment. The company at present is modernizing one of its furnaces at its Edgar Thomson works and will soon begin a similar program on another furnace there.

... NON-FERROUS ...

... *Buying interest light all week ... Moderate tonnages of export copper sold at 11.65c., f.a.s. ... Week's prime Western zinc sales were 1046 tons.*

NEW YORK, March 12—The non-ferrous markets were consistently dull all last week, probably due to the fact that most consumers are well covered on their nearby needs and in view of the uncertain political outlook are hesitant about making forward commitments. Prices remained nominally unchanged all week, except for tin which rose sharply when the newest British edict governing tin trading, that requiring importers to purchase sterling at the official rate rather than in the open market, went into effect. Copper sales averaged about 1000 tons a

day, with producers' quotations unchanged at 11.50c. per lb., Connecticut Valley, for electrolytic grade. There were several moderate lots of the red metal sold abroad at prices reported to be 11.65c., f.a.s., for March delivery, and 11.60c. for April.

Lead

With March needs practically all covered and April 60 per cent bought, lead demand has moderated considerably. Waiting lists, which had been a feature of the market during the three weeks of heavy buying, have completely disap-

peared and only sporadic carlot business was being booked in the first two days of the current week. Estimates that shipments in February, a short month, would be around 39,000 tons, have provided support to the present unchanged quotation of 5.25c. per lb., New York.

Zinc

Prime Western sales in the past week were 1046 tons, as against 14,500 tons in the preceding week, and shipments were 4150 compared with 4692 tons a week ago. The bulk of the 14,500 tons sold two weeks ago represented purchases made before the last price increase. At that time consumers apparently covered their nearby needs thoroughly and unable to find any bullishness in recent business news have stayed shy of the market since. Quotations are unchanged at 6.14c. per lb., New York.

Tin

There was fairly active trading in nearby tin last week as buyers sought coverage in expectation that high prices would result should the British Government actually take the rumored action of requiring importers to purchase sterling at the official rate of \$4.04, instead of at the open market price of around \$3.82.

On Saturday, the anticipated decree was put into effect by the British, and Straits tin here immediately rose to 49c. per lb., from 47.75c. on Friday. This new exchange restriction increases cost of tin to importers between 1½c. and 1¾c. per lb. However, offerings of metal acquired previous to March 9, served to keep the market temporarily below the import cost level.

NON-FERROUS PRICES

Cents per lb. for early delivery

	Mar. 6	Mar. 7	Mar. 8	Mar. 9	Mar. 11	Mar. 12
Copper, Electrolytic ¹	11.50	11.50	11.50	11.50	11.50	11.50
Copper, Lake	11.50	11.50	11.50	11.50	11.50	11.50
Tin, Straits, New York	47.625	47.875	47.75	....	49.00	48.75
Zinc, East St. Louis ²	5.75	5.75	5.75	5.75	5.75	5.75
Lead, St. Louis ³	5.10	5.10	5.10	5.10	5.10	5.10

¹ Delivered Conn. Valley. Deduct ¼c. for New York delivery. ² Add 0.39c. for New York delivery. ³ Add 0.15c. for New York delivery.

Warehouse Prices

Cents per lb., Delivered

	New York	Cleveland
Tin, Straits, pig	50.00c.	52.00c.
Copper, Lake	13.25c.	12.625c.
Copper, electro	12.75c.	12.625c.
Copper, castings	12.375c.	12.375c.
*Copper sheets, hot-rolled	20.12c.	20.12c.
*Yellow brass sheets ..	18.31c.	18.31c.
*Seamless brass tubes..	21.06c.	21.06c.
*Seamless copper tubes.	20.62c.	20.62c.
*Yellow brass rods	14.26c.	14.26c.
Zinc slabs	7.10c.	7.75c.
Zinc sheets, No. 9 casks	12.00c.	13.35c.
Lead, American pig	6.25c.	5.75c.
Lead, bar	8.20c.	8.50c.
Lead, sheets, cut	8.50c.	8.50c.
Antimony, Asiatic	16.00c.	17.00c.
Alum., virgin, 99 per cent plus	21.50c.	22.50c.
Alum., No. 1 remelt., 98 to 99 per cent	19.00c.	19.50c.
Solder, ½ and ½	30.875c.	30.00c.
Babbitt metal, anti-friction grade	27.75c.	20.25c.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33¼; on brass sheets and rods, 40; on brass tubes, 33¼, and copper tubes, 40.

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible ..	9.50c.	10.125c.
Copper, hvy. and wire..	8.50c.	8.875c.
Copper, light and bottoms	7.50c.	8.00c.
Brass, heavy	5.00c.	5.50c.
Brass, light	4.125c.	4.875c.
Heavy machine composition	8.00c.	8.625c.
No. 1 yel. brass turnings	4.75c.	5.75c.
No. 1 red brass or composition, turnings	7.50c.	8.00c.
Lead, heavy	4.00c.	7.375c.
Cast aluminum	8.00c.	9.00c.
Sheet aluminum	14.00c.	15.00c.
Zinc	2.75c.	4.00c.

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 20c.-21c. a lb.; No. 12 remelt No. 2 standard, 19c.-19.50c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICKSILVER, \$182-\$183 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 12c. a lb.

Pittsburgh Coke & Iron Buys Land From C-I

PITTSBURGH—Pittsburgh Coke & Iron Co. has purchased 118 additional acres of land on Neville Island, near here, from the Carnegie Land Co., subsidiary of Carnegie-Illinois Steel Corp. One large tract of 70 acres is near enough to the present Pittsburgh Coke & Iron Co. plant to be especially suitable for future expansion.

File Types Reduced

WASHINGTON—A revision of simplified practice recommendations for files and rasps, reducing the number of types from 496 to 377, will become effective April 1 because the proposals have been accorded the required degree of acceptance by the industry. Identified as simplified practice recommendation R6-40, copies of the new recommendations are obtainable without charge by writing to the Bureau of Standards, Washington.

IRON AND STEEL SCRAP

... Composite price is unchanged at \$16.71 for fourth week.

MARCH 12—The market continues to hold its previous level and for the fourth week the composite average price for No. 1 heavy melting steel is \$16.71. While dullness still rules in most districts, here and there an element of strength is seen. For the first time in many weeks a mill purchase was made in the Chicago area and the price paid was at the top of the range quoted the week before. Furthermore, dealers are having difficulty in covering at anything less than the sale price. Short coverages at St. Louis have boosted some prices there. At Detroit the bundle market is considerably stronger, although quotations are unchanged. Heavy breakable cast is strong at Philadelphia. Not much material is coming out at present prices and in some sections dealers are unwilling to commit themselves for large tonnages on which they might be short. The recent sale of 25,000 tons to an eastern Pennsylvania mill has had no effect upon the market pricewise since much of this material had originally been accumulated on barges for export delivery. In fact, flow to the Eastern seaboard has reversed itself in recent weeks due to the uncertainty of the vessel situation.

Counteracting weakness in the market is seen at Pittsburgh, where railroad heavy melting steel is softer, based on prices paid on recent lists, although railroad steel at Cleveland was practically unchanged.

Pittsburgh

Quietness still prevails, with No. 1 heavy melting steel quotably unchanged at \$16.75 to \$17.25. There were additional offers within the past week involving small tonnages into consumption at \$16.75. Other points in the district in some instances continue to pay the equivalent of \$17.25 a ton into consumption. Railroad heavy melting is quotable this week 25c. lower at \$17.75 to \$18.25, reflecting prices paid by brokers and consumers on the two most recent lists. Cast iron borings and mixed borings are quotable 75c. higher on appraisals in this market at \$8.75 to \$9.25, the strength being due to a consumer sale made at Johnstown, Pa.

Chicago

The first mill buy in many weeks was recorded here last week, when \$16 was paid for heavy melting steel, confirming the top of the range quoted a week ago on the basis of broker-dealer transactions. Brokers are still paying \$15.75 and \$16 to dealers, the latter price prevailing.

Some doubt has been expressed as to the brokers' ability to cover any of this

latest order at less than the sale price. A few old \$16.50 orders are still unfilled however. A strengthening undertone is evident here in spite of an uninspiring operating rate. The movement of material from the country to dealers' yards is said to be slow. Prices are unchanged from last week.

Philadelphia

The market here is unchanged this week with the exception of mixed yard scrap for foundry use which is now quotable at \$16.50 flat, an increase of 25c. over the average of a week ago. Heavy breakable cast is strong at \$18.50 and stove plate is firm at \$15. Several small lots of No. 1 steel were purchased in the past week within the quoted ranges. Export buying continues at a moderate pace with quotations unchanged. Another boat is expected on the 15th.

Youngstown

Mills remain out of the market here, but nevertheless scrap is none too free. Published prices remain nominal and unchanged.

Cleveland

Heavy melting prices remain nominal and unchanged. If anything, quotations may be a trifle low due to the fact material is scarce and dealers unwilling to commit themselves for large tonnages at current quotations. The local railroad steel went for around \$17.50, practically unchanged from last month, but only 3000 tons altogether was sold since the carrier's scrapping operations have been curtailed partly due to bad weather.

Buffalo

About 10,000 tons of material, including No. 1 heavy melting steel and allied grades, was purchased this week by the largest consumer in the district at a price within the quoted range of \$16 to \$16.50 for No. 1 steel. Immediately after the sale, bids were reduced. Other grades are firm with little activity.

St. Louis

Dealers have advanced buying prices to bring out material needed to cover short interests, and a few items on the scrap list therefore are 25c. and 50c. higher than the quotation a week ago. With more moderate weather, scrap on order is coming in faster, but new offerings are said to be light. Railroad lists: Louisville & Nashville, 4900 tons; Wabash, 3000 tons; Gulf Coast Lines, 1400 tons; Ann Arbor, 600 tons, and Chicago & Eastern Illinois, 375 tons.

Cincinnati

Dealers for the second consecutive week are holding prices unchanged. The mixed condition of the general market has aroused a conviction that the district market is now scraping bottom and an upward movement is in the offing. Buying is confined to small lots, although the number of sales the past week are reported to have been larger than in the preceding period.

Birmingham

Although Republic entered the market for a few purchases, the scrap market has not taken on any change as to advance in prices or lower quotations. Dealers here affirm that stock accumulations are unimpressive and indications do not suggest any real movements for the remainder of the month.

Detroit

Despite the fact that there is no change in iron and steel scrap quotations in this area yet, there is evidence that some change can be expected shortly. Two forces which have been brought to bear on the local market are tending to shove prices higher. The first of these is the presence of an outside consumer which has put a great deal of strength in the bundle market by buying direct from producers and also, apparently, through regular trade routes to load vessels which are expected to move down-lake in April. The second influence is activity in the tool and die industry which is expected to grow in importance.

New York

There has been more movement of material on cars to eastern Pennsylvania than there has been abroad in recent weeks. This reversal of trend has tended to relieve some of the congestion of material on barges, caused particularly by the continued and aggravated uncertainty of British vessel movements. Some of the material to cover the 25,000-ton sale reported in the Philadelphia market last week is being taken off such barges and loaded on freight cars. Buying prices are unchanged here, but scrap is coming out none too freely and a rise would ordinarily be indicated were it not for present accumulations on water.

Boston

Heavy cast broken up small has been sold to foundries at \$17.50 a ton delivered and large broken to steel mills at \$17, while scattered carlots of steel turnings at \$5.15 a ton on cars and skeletons at \$8.75 a ton on cars have been moved, but the domestic market generally is quite flat. Brokers believe that steel mills have overstayed the market and will be forced to buy soon. Loading of scrap at Boston and Providence continues lively, and bids fair to continue so. Big inroads have been made in exporters' scrap supplies, and buying for shipment abroad may start up before long.

Toronto

With Canadian steel mills running at capacity, demand for iron and steel scrap is more active than at any time this year, and some consumers are beginning to show concern regarding future supplies. While reports have appeared that Canadian consumers have been inquiring in Buffalo for scrap, local dealers state that imports from this point are not likely at this time, especially at present local price levels. Taking into account the 11 per cent exchange rate, as well as duty and freight, would bring the delivered price several dollars above that at which scrap can be obtained from this side of the border. Mills continue to take all the steel scrap offered by local dealers.

Iron and Steel Scrap Prices

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	\$16.75 to \$17.25
Railroad heavy melting	17.75 to 18.25
No. 2 heavy melting	15.25 to 15.75
Railroad scrap rails	17.75 to 18.25
Rails 3 ft. and under	20.50 to 21.00
Comp. sheet steel	16.75 to 17.25
Hand bundled sheets	15.75 to 16.25
Heavy steel axle turn.	14.75 to 15.25
Machine shop turnings	10.50 to 11.00
Short. shov. turnings	12.00 to 12.50
Mixed bor. & turn.	8.75 to 9.25
Cast iron borings	8.75 to 9.25
Cast iron carwheels	18.50 to 19.00
Heavy breakable cast	15.00 to 15.50
No. 1 cupola cast	18.00 to 18.50
RR. knuckles & coup.	20.50 to 21.00
Rail coil springs	20.50 to 21.00
Rail leaf springs	20.50 to 21.00
Rollad steel wheels	20.50 to 21.00
Low phos. billet crops	21.00 to 21.50
Low phos. punchings	20.50 to 21.00
Low phos. heavy plate	19.50 to 20.00
Railroad malleable	21.00 to 21.50

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	\$17.00 to \$17.50
No. 2 hvy. mltng. steel	16.00 to 16.50
Hydraulic bund., new	17.00 to 17.50
Hydraulic bund., old	14.00 to 14.50
Steel rails for rolling	20.50 to 21.00
Cast iron carwheels	20.00 to 20.50
Hvy. breakable cast	18.50
No. 1 cupola cast	20.00 to 20.50
Mixed yard (f'd'y) scrap	16.50
Stove plate (steel wks.)	15.00
Railroad malleable	21.00 to 22.00
Machine shop turn.	10.00 to 10.50
No. 1 blast furnace	10.00
Cast borings	10.50 to 11.00
Heavy axle turnings	15.00 to 15.50
No. 1 low phos. hvy.	21.00 to 21.50
Couplers & knuckles	21.00 to 21.50
Rollad steel wheels	21.00 to 21.50
Steel axles	21.50 to 22.00
Shafting	22.00 to 22.50
Spec. iron & steel pipe	16.00 to 16.50
Cast borings (chem.)	14.00 to 14.50

CHICAGO

Delivered to Chicago district consumers:

Per Gross Ton	
Hvy. mltng. steel	\$15.75 to \$16.00
Auto. hvy. mltng. steel alloy free	14.75 to 15.00
No. 2 auto steel	12.75 to 13.25
Shoveling steel	15.75 to 16.00
Factory bundles	15.25 to 15.50
Dealers' bundles	13.75 to 14.00
No. 1 busheling	14.75 to 15.00
No. 2 busheling, old	5.75 to 6.25
Rollad carwheels	18.00 to 18.50
Railroad tires, cut	18.25 to 18.75
Railroad leaf springs	17.75 to 18.25
Steel coup. & knuckles	17.75 to 18.25
Axle turnings	14.50 to 15.00
Coil springs	18.75 to 19.25
Axle turn. (elec.)	16.25 to 16.75
Low phos. punchings	18.00 to 18.50
Low phos. plates 12 in. and under	17.50 to 18.00
Cast iron borings	9.00 to 9.50
Short shov. turn.	9.50 to 10.00
Machine shop turn.	8.75 to 9.25
Rerolling rails	18.25 to 18.75
Steel rails under 3 ft.	17.50 to 18.00
Steel rails under 2 ft.	18.50 to 19.00
Angle bars, steel	17.75 to 18.25
Cast iron carwheels	17.00 to 17.50
Railroad malleable	18.25 to 18.75
Agric. malleable	14.25 to 14.75
Per Net Ton	
Iron car axles	21.50 to 22.00
Steel car axles	20.25 to 20.75
Locomotive tires	14.25 to 14.75
Pipes and flues	10.75 to 11.25
No. 1 machinery cast	13.50 to 14.00
Clean auto. cast	13.75 to 14.25
No. 1 railroad cast	13.25 to 13.75
No. 1 agric. cast	12.00 to 12.50
Stove plate	8.75 to 9.25
Grate bars	9.50 to 10.00
Brake shoes	10.50 to 11.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	\$17.00 to \$17.50
No. 2 hvy. mltng. steel	16.00 to 16.50
Low phos. plate	20.00 to 20.50
No. 1 busheling	16.25 to 16.75
Hydraulic bundles	16.50 to 17.00
Machine shop turn.	11.00 to 11.50

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	\$16.00 to \$16.50
No. 2 hvy. mltng. steel	15.00 to 15.50
Comp. sheet steel	15.50 to 16.00
Light bund. stampings	13.00 to 13.50
Drop forge flashings	14.00 to 14.50
Machine shop turn.	9.00 to 9.50
Short shov. turn.	10.00 to 10.50
No. 1 busheling	14.75 to 15.25
Steel axle turnings	14.50 to 15.00
Low phos. billet and bloom crops	
Cast iron borings	21.50 to 22.00
Cast iron borings	10.00 to 10.50
Mixed bor. & turn.	10.00 to 10.50
No. 2 busheling	10.00 to 10.50
No. 1 cupola cast	17.00 to 17.50
Railroad grate bars	13.50 to 14.00
Stove plate	13.50 to 14.00
Rails under 3 ft.	21.00 to 21.50
Rails for rolling	20.00 to 20.50
Railroad malleable	19.50 to 20.00

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	\$16.00 to \$16.50
No. 2 hvy. mltng. steel	14.50 to 15.00
Scrap rails	17.00 to 17.50
New hvy. b'ndled sheets	14.00 to 14.50
Old hydraulic bundles	12.50 to 13.00
Drop forge flashings	14.00 to 14.50
No. 1 busheling	14.00 to 14.50
Machine shop turn.	9.50 to 10.00
Shov. turnings	12.50 to 13.00
Mixed bor. & turn.	10.50 to 11.00
Cast iron borings	10.50 to 11.00
Knuckles & couplers	20.00 to 21.00
Coil & leaf springs	20.00 to 21.00
Rollad steel wheels	20.00 to 21.00
No. 1 machinery cast	17.50 to 18.00
No. 1 cupola cast	16.50 to 17.00
Stove plate	14.50 to 15.00
Steel rails under 3 ft.	21.50 to 22.00
Cast iron carwheels	17.50 to 18.00
Railroad malleable	19.00 to 19.50

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting	\$14.50 to \$15.00
No. 1 hvy. melting	14.00 to 14.50
No. 2 hvy. melting	13.50 to 14.00
No. 1 locomotive tires	15.75 to 16.25
Misc. stand. sec. rails	15.25 to 15.75
Railroad springs	16.50 to 17.00
Bundled sheets	9.00 to 9.50
No. 1 busheling	13.00 to 13.50
Cast bor. & turn.	5.25 to 5.75
Machine shop turn.	6.50 to 7.00
Heavy turnings	10.00 to 10.50
Rails for rolling	17.50 to 18.00
Steel car axles	18.00 to 18.50
No. 1 RR wrought	10.25 to 10.75
No. 2 RR wrought	13.25 to 13.75
Steel rails under 3 ft.	18.00 to 18.50
Steel angle bars	15.50 to 16.00
Cast iron carwheels	15.50 to 16.00
No. 1 machinery cast	16.50 to 17.00
Railroad malleable	16.00 to 16.50
Breakable cast	13.75 to 14.25
Stove plate	11.25 to 11.75
Grate bars	10.00 to 10.50
Brake shoes	11.00 to 11.50

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel	\$12.50 to \$13.00
No. 2 hvy. mltng. steel	10.50 to 11.00
Scrap rails for mltng.	17.00 to 17.50
Loose sheet clippings	8.00 to 8.50
Hydrau. b'ndled sheets	12.00 to 12.50
Cast iron borings	3.75 to 4.25
Machine shop turn.	5.00 to 5.25
No. 1 busheling	9.00 to 9.50
No. 2 busheling	3.00 to 3.25
Rails for rolling	18.50 to 19.00
No. 1 locomotive tires	14.00 to 14.50
Short rails	19.00 to 19.50
Cast iron carwheels	14.50 to 15.00
No. 1 machinery cast	16.00 to 16.50
No. 1 railroad cast	14.00 to 14.50
Burnt cast	7.75 to 8.25
Stove plate	7.75 to 8.25
Agricul. malleable	12.50 to 13.00
Railroad malleable	15.50 to 16.00
Mixed hvy. cast	13.50 to 14.00

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting steel	\$15.00
No. 2 hvy. melting steel	14.00
No. 1 busheling	13.00
Scrap steel rails	15.00
Steel rails under 3 ft.	16.00

Rails for rolling	16.50
Long turnings	5.00
Cast iron borings	7.50
Stove plate	11.00
Steel axles	20.06
No. 1 RR wrought	14.00
No. 1 cast	15.00
No. 2 cast	11.00
Cast iron carwheels	13.00
Steel car wheels	16.00

DETROIT

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. industrial steel	12.50 to 13.00
No. 2 hvy. mltng. steel	11.50 to 12.00
Borings and turnings	6.50 to 7.00
Long turnings	6.00 to 6.50
Short shov. turnings	8.00 to 8.50
No. 1 machinery cast	13.50 to 14.00
Automotive cast	15.00 to 15.50
Hvy. breakable cast	10.50 to 11.00
Stove plate	8.50 to 9.00
Hydraulic comp. sheets	13.25 to 13.75
New factory bushel.	12.00 to 12.50
Sheet clippings	8.25 to 8.75
Flashings	11.75 to 12.25
Low phos. plate scrap	13.50 to 14.00

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel	\$13.00 to \$13.50
No. 2 hvy. mltng. steel	11.50 to 12.00
Hvy. breakable cast	14.00
No. 1 machinery cast	16.00 to 16.50
No. 2 cast	12.50 to 13.00
Stove plate	10.50 to 11.00
Steel car axles	19.00 to 20.00
Shafting	19.00 to 20.00
No. 1 RR wrought	14.00 to 15.00
No. 1 wrought long	12.50 to 13.00
Spec. iron & steel pipe	13.50 to 14.00
Rails for rolling	15.50 to 16.00
Clean steel turnings	6.00 to 6.25
Cast borings*	6.00 to 6.25
No. 1 blast furnace	6.00 to 6.25
Cast borings (chem.)	Nominal
Unprepared yard scrap	7.00 to 7.50
Light iron	5.00 to 5.50

Per gross ton, delivered local foundries:

No. 1 machin. cast	\$17.00 to \$18.50
No. 2 cast	16.50 to 17.00

* \$1.50 less for truck loads.

BOSTON

Dealers' buying prices per gross ton on cars:

Breakable cast	\$12.65
Machine shop turn.	5.15
Mixed bor. & turn.	\$4.50 to 4.75
Bun. skeleton long	8.75
Shafting	17.00 to 17.25
Stove plate	9.75 to 10.00
Cast bor. chemical	8.00 to 8.50

Per gross ton delivered consumers' yards:

Textile cast	\$17.00 to \$19.00
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No. 1 machine cast... 17.00 to 19.00

Per gross ton delivered dealers' yards:

No. 1 hvy. mltng. steel	\$13.00
No. 2 steel	12.00

PACIFIC COAST

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel	\$10.50 to \$12.50
No. 2 hvy. mltng. steel	9.50 to 11.50

CANADA

Dealers' buying prices at these yards, per gross ton:

Toronto Montreal	
Low phos. steel	\$11.50 \$11.00
No. 1 hvy. mltng. steel	11.00 10.50
No. 2 hvy. mltng. steel	9.75 9.25
Mixed dealers steel	8.75 8.25
Drop forge flashings	9.75 9.25
New loose clippings	8.75 8.25
Busheling	6.00 5.50
Scrap pipe	7.75 7.25
Steel turnings	7.00 6.50
Cast borings	6.50 6.00
Machinery cast	17.00 to 16.50
Dealers' cast	16.00 to 15.50
Stove plate	12.00 to 11.50

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered, barges	
No. 1 hvy. mltng. steel	\$14.00
No. 2 hvy. mltng. steel	11.50
No. 2 cast	12.00 to 12.50
Stove plate	10.00 to 10.50

Boston on cars at Army Base or Mystic Wharf

No. 1 hvy. mltng. steel	\$15.00 to \$15.50
No. 2 hvy. mltng. steel	14.00
Rail (scrap)	\$15.00 to \$15.50
Stove plate	8.00 to 8.50

Philadelphia, delivered alongside boats, Port Richmond.

No. 1 hvy. mltng. steel	\$16.50 to \$17.00
No. 2 hvy. mltng. steel	15.25 to 15.50

PRICES ON FINISHED AND SEMI-FINISHED IRON AND STEEL

Steel prices on these pages are base prices only and f.o.b. mill unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are effected by extras, deductions, and in most cases the amount of freight which must be absorbed in order to meet competition

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Re-rolling only). Prices delivered Detroit are \$2 higher. F.o.b. Duluth, billets only, \$2 higher.

Per Gross Ton
Re-rolling\$34.00
Forging quality 40.00

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

Per Gross Ton
Open hearth or bessemer\$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

Per Lb.
Grooved, universal and sheared1.90c.

Wire Rods

(No. 5 to 9/32 in.)

Per Lb.
Pittsburgh, Chicago or Cleveland 2.00c.
Worcester, Mass. 2.10c.
Birmingham 2.00c.
San Francisco 2.45c.
Galveston 2.25c.
9/32 in. to 47/64 in. \$3 a net ton higher.
Quantity extras apply.

SOFT STEEL BARS

Base per Lb.
Pittsburgh, Chicago, Gary, Cleveland, Buffalo and Birmingham 2.15c.
Detroit, delivered 2.25c.
Duluth 2.25c.
Philadelphia, delivered 2.47c.
New York 2.49c.
On cars dock Gulf ports 2.50c.
On cars dock Pacific ports 2.75c.

RAIL STEEL BARS

(For merchant trade)

Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham 2.15c.
On cars dock Tex. Gulf ports 2.50c.
On cars dock Pacific ports 2.75c.

BILLET STEEL REINFORCING BARS

(Straight lengths as quoted by distributors)

Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Cleveland, Youngstown or Sparrows Pt. 1.90c.
Detroit, delivered 2.00c.
On cars dock Tex. Gulf ports 2.25c.
On cars dock Pacific ports 2.25c.

RAIL STEEL REINFORCING BARS

(Straight lengths as quoted by distributors)

Pittsburgh, Chicago, Gary, Buffalo, Cleveland, Youngstown or Birmingham 1.90c.
Detroit, delivered 2.00c.
On cars dock Tex. Gulf ports 2.25c.
On cars dock Pacific ports 2.25c.

IRON BARS

Chicago 2.25c.
Pittsburgh (refined) 3.75c.

COLD FINISHED BARS AND SHAFTING*

Pittsburgh, Buffalo, Cleveland, Chicago, and Gary 2.65c.
Detroit 2.70c.

* In quantities of 20,000 to 39,999 lb.

PLATES

Base per Lb.
Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont, Del. 2.10c.

Philadelphia, del'd 2.15c.
New York, del'd 2.29c.
On cars dock Gulf ports 2.45c.
On cars dock Pacific ports 2.60c.
Wrought iron plates, P'tg. 3.80c.

FLOOR PLATES

Pittsburgh or Chicago 3.35c.
New York, del'd 3.71c.
On cars dock Gulf ports 3.70c.
On cars dock Pacific ports 3.95c.

STRUCTURAL SHAPES

Base per Lb.

Pittsburgh, Chicago, Gary, Buffalo, Bethlehem or Birmingham 2.10c.
Philadelphia, del'd 2.215c.
New York, del'd 2.27c.
On cars dock Gulf ports 2.45c.
On cars dock Pacific ports 2.70c.

STEEL SHEET PILING

Base per Lb.

Pittsburgh, Chicago or Buffalo 2.40c.
On cars dock Gulf ports 2.85c.
On cars dock Pacific ports 2.90c.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton\$40.00
Angle bars, per 100 lb. 2.70

F.o.b. Basing Points

Light rails (from billets) per gross ton\$40.00
Light rails (from rail steel) per gross ton 39.00

Base per Lb.

Cut spikes 3.00c.
Screw spikes 4.55c.
Tie plates, steel 2.15c.
Tie plates, Pacific Coast ports 2.25c.
Track bolts, to steam railroads 4.15c.
Track bolts to jobbers, all sizes (per 100 counts) 65-5

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Portsmouth, Ohio, Welton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa., Buffalo; on spikes alone, Youngstown, Lebanon Pa., Richmond, Va.

SHEETS

Hot Rolled

Base per Lb.

Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown or Chicago 2.10c.
Detroit, delivered 2.20c.
Philadelphia, delivered 2.27c.
Granite City 2.20c.
On cars dock Pacific ports 2.60c.
Wrought iron, Pittsburgh 4.10c.

Cold Rolled*

Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown or Chicago 3.05c.
Detroit, delivered 3.15c.
Granite City 3.15c.
Philadelphia, delivered 3.37c.
On cars dock Pacific ports 3.65c.

* Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base.

Galvanized Sheets, 24 Gage

Pittsburgh, Chicago, Gary, Sparrows Point, Buffalo, Middletown, Youngstown or Birmingham 3.50c.
Philadelphia, del'd 3.67c.
Granite City 3.60c.
On cars dock Pacific ports 4.00c.
Wrought iron, Pittsburgh 6.10c.

Electrical Sheets

(F.o.b. Pittsburgh)

Base per Lb.

Field grade 3.20c.
Armature 3.55c.
Electrical 4.05c.
Motor 4.95c.
Dynamo 5.65c.
Transformer 72 6.15c.
Transformer 65 7.15c.
Transformer 58 7.65c.
Transformer 52 8.45c.

Silicon Strip in coils—Sheet price plus silicon sheet extra width extra plus 25c per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

Long Terns

No. 24 unassorted 8-lb. coating f.o.b. Pittsburgh or Gary 3.80c.
F.o.b. cars dock Pacific ports 4.50c.

Vitreous Enameling Stock, 20 Gage*

Pittsburgh, Chicago, Gary, Youngstown, Middletown or Cleveland 3.35c.
Detroit, del'd 3.45c.
Granite City 3.45c.
On cars dock Pacific ports 3.95c.

TIN MILL PRODUCTS

Tin Plate

Per Base Box

Standard cokes, Pittsburgh, Chicago and Gary (100 lb.)\$5.00
Standard cokes, Granite City (100 lb.) 5.10

Special Coated Manufacturing Terns

Per Base Box

Granite City\$4.40
Pittsburgh or Gary 4.30

Roofing Terne Plate

(F.o.b. Pittsburgh per Package, 112 Sheets)

20x14 in. 20x28 in.
8-lb. coating I.C. \$6.00 \$12.00
15-lb. coating I.C. 7.00 14.00
20-lb. coating I.C. 7.50 15.00
25-lb. coating I.C. 8.00 16.00
30-lb. coating I.C. 8.63 17.25
40-lb. coating I.C. 9.75 19.50

Black Plate, 29 gage and lighter*

Pittsburgh, Chicago and Gary 3.05c.
Granite City 3.15c.
On cars dock Pacific ports, boxed 4.00c.

* Black plate base price applies to 29 gage within certain width and length limitations.

HOT ROLLED STRIP

(Widths up to 12 in.)

Base per Lb.

Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown or Birmingham 2.10c.
Detroit, delivered 2.20c.
On cars dock Pacific ports 2.70c.

Cooperage Stock

Pittsburgh & Chicago 2.20c.

COLD ROLLED STRIP*

Base per Lb.

Pittsburgh, Youngstown or Cleveland 2.80c.
Chicago 2.90c.
Detroit, delivered 2.90c.
Worcester 3.00c.

* Carbon 0.25 and less.

Commodity Cold Rolled Strip

Pittsburgh, Youngstown, or Cleveland 2.95c.
Detroit, delivered 3.05c.
Worcester 3.35c.

COLD ROLLED SPRING STEEL

Pittsburgh

and Cleveland Worcester
Carbon 0.26-0.50% 2.80c. 3.00c.
Carbon 0.51-0.75 4.30c. 4.50c.
Carbon 0.76-1.00 6.15c. 6.35c.
Carbon 1.01-1.25 8.35c. 8.55c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh, Chicago, Cleveland and Birmingham)

To Manufacturing Trade

	Per Lb.
Bright wire	2.60c.
Galvanized wire, base.....	2.60c.
Spring wire	3.20c.

To the Trade

	Base per Keg
Standard wire nails	\$2.55
Coated nails	2.55
Cut nails, carloads	3.55

Base per 100 Lb.

Annealed fence wire	\$3.05
Woven wire fence, 15½ gage and heavier base col.....	67
Fence posts (carloads), base col.....	69
Single loop bale ties, base col.....	56
Galvanized barbed wire on 80-rod spools (carloads) base col.....	70
Twisted barless wire, base col.....	70

Note: Birmingham base same on above items, except spring wire.

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills
F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld		Wrought Iron	
In.	Black Galv.	In.	Black Galv.
1/4	56 36	1/4 & 1/2	+9 +30
1/2	59 43½	1/2	24 6½
3/4	63½ 54	3/4	30 13
1	66½ 58½	1 & 1 1/4	34 19
1 to 3	68½ 60½	1 1/2	38 21½
		2	37½ 21
Lap Weld			
2	61 52½	2	30½ 15
2 1/2	64 55½	2 1/2 to 3 1/2	34½ 17½
3 1/2	66 57½	4	33½ 21
7	8.65 55½	4 1/2	8.32½ 20
9	10.64½ 55	9 to 12	28½ 15
11	12.63½ 54		

Butt weld, extra strong, plain ends		Lap weld, extra strong, plain ends	
1/4	54½ 41½	1/4 & 1/2	+10 +43
1/2	56½ 45½	1/2	25 9
3/4	61½ 53½	3/4	31 15
1	65½ 57½	1 to 2	38 22½
1 to 3	67 60		

Lap weld, extra strong, plain ends			
2	59 51½	2	33½ 18½
2 1/2	63 55½	2 1/2	4.39½ 25½
3 1/2	66½ 59	4	5.37½ 24
7	8.65½ 56	7 & 8	38½ 24½
9	10.64½ 55	9 to 12	32 20½
11	12.63½ 54		

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or \$4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or \$2 a ton higher, on all butt weld 8 in. and smaller.

Boiler Tubes

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. (Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

		Seamless		Lap Weld	
		Cold Drawn	Hot Rolled	Cold Drawn	Hot Rolled
1 in. o.d.	13 R.W.G.	\$ 9.01	\$ 7.82		
1 1/4 in. o.d.	13 R.W.G.	10.07	8.26		
1 1/2 in. o.d.	13 R.W.G.	11.70	10.23	\$9.72	
1 3/4 in. o.d.	13 R.W.G.	13.42	11.64	11.66	
2 in. o.d.	13 R.W.G.	15.03	13.04	12.38	
2 1/4 in. o.d.	13 R.W.G.	16.76	14.54	13.79	
2 1/2 in. o.d.	12 R.W.G.	18.45	16.01	15.16	
2 3/4 in. o.d.	12 R.W.G.	20.21	17.54	16.56	
3 in. o.d.	12 R.W.G.	21.92	18.99	17.54	
3 1/2 in. o.d.	12 R.W.G.	22.48	19.50	18.35	
3 3/4 in. o.d.	11 R.W.G.	28.37	24.62	23.15	
4 in. o.d.	10 R.W.G.	35.20	30.54	28.60	
4 1/2 in. o.d.	10 R.W.G.	43.04	37.35	35.22	
5 in. o.d.	9 R.W.G.	54.01	46.87	44.25	
6 in. o.d.	7 R.W.G.	82.93	71.96	68.14	

Extras for less carload quantities:

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.....	5%
20,000 lb. or ft. to 29,999 lb. or ft.....	10%
10,000 lb. or ft. to 19,999 lb. or ft.....	30%
5,000 lb. or ft. to 9,999 lb. or ft.....	30%
2,000 lb. or ft. to 4,999 lb. or ft.....	45%
Under 2,000 lb. or ft.....	65%

CAST IRON WATER PIPE

Per Net Ton

*6-in. and larger, del'd Chicago.....	\$54.80
6-in. and larger, del'd New York	52.20
*6-in. and larger, Birmingham.....	46.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles.....	52.00
F.o.b. dock, Seattle.....	52.00
4-in. f.o.b. dock, San Francisco or Los Angeles	55.00
F.o.b. dock, Seattle.....	52.00

Class "A" and gas pipe, \$3 extra
4-in. pipe is \$3 a ton above 6-in.

Prices for lots of less than 200 tons. For 500 tons and over, 6-in. and larger is \$15. Birmingham, and \$33.80 delivered Chicago.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland Birmingham or Chicago)

Per Cent Off List

Machine and carriage bolts:	
1/2 in. and 6 in. and smaller.....	68½
Larger and longer up to 1 in.	66
1 1/4 in. and larger	64
Lag bolts	66
Plow bolts, Nos. 1, 2, 3, and 7	68½
Hot pressed nuts, and c.p.c. and t-nuts, square or hex. blank or tapped:	
1/2 in. and smaller	67
9/16 in. to 1 in. inclusive	64
1 1/4 in. to 1 1/2 in. incl.	62
1 1/2 in. and larger	60

On the above items with the exception of plow bolts, there is an additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts U.S.S. S.A.E.	
1/2 in. and smaller	67 70
9/16 to 1 in.	64 65
1 1/4 in. and larger.....	62 62

In full container lots, 10 per cent additional discount.

Stove bolts in packages, with nuts loose	72½
Stove bolts in packages, with nuts attached, add 15% extra.	
Stove bolts in bulk	83½
On stove bolts freight is allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.	

Large Rivets

(1/2 in. and larger)

Base per 100 Lb.

F.o.b. Pittsburgh, Cleveland Chicago, Birmingham

Small Rivets

(7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham ...65 and 10

Cap and Set Screws

(Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.)

Per Cent Off List

Milled hexagon head, cap screws, 1 in. dia. and smaller.....	50 and 10
Milled headless set screws, cut thread 1/4 in. and larger.....	64
3/16 in. and smaller	73
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	70
Upset set screws, cup and oval points	75
Milled studs	52

Alloy Steel

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Base price, \$56.00 a gross ton.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.
Open-hearth grade, base.....2.70c.
Delivered, Detroit

Alloy

Differential

per 100 Lb.

200 (1 1/2 Nickel)

2100 (1 1/2 Nickel)	\$0.75
2300 (3 1/2 Nickel)	1.55
2500 (5 Nickel)	2.25
31 Nickel-chromium	0.79
3200 Nickel-chromium	1.85
3300 Nickel-chromium	3.80
3400 Nickel-chromium	3.20
4100 Chromium-molybdenum (0.15 to 0.25 Molybdenum) ..	0.55
4100 Chromium-molybdenum (0.25 to 0.40 Molybdenum) ..	0.75
4340 Chr.-Ni.-Mo.	1.85
4345 Chr.-Ni.-Mo.	1.85
4600 Nickel - molybdenum (0.20 to 0.30 Mo. 1.50 to 2.00 Ni.) ..	1.10
5100 Chrome steel (0.60-0.90 Cr.) ..	0.35
5100 Chrome steel (0.80-1.10 Cr.) ..	0.45
6100 Chromium spring steel.....	0.15
6100 Chromium-vanadium bar ..	1.20
6100 Chromium-vanadium spring steel	0.85
Chromium-nickel vanadium	1.50
Carbon-vanadium	0.35

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2 1/2 in. thick or over take the billet base.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. base per lb. Delivered Detroit, 3.45c., carlots.

STAINLESS & HEAT RESISTANT ALLOYS

(Base prices, cents per lb. f.o.b. Pittsburgh)

Chrome-Nickel

	No. 304	No. 303
Forging billets	21.25c.	20.40c.
Bars	25c.	24c.
Plates	23c.	27c.
Structural shapes.....	25c.	24c.
Sheets	36c.	34c.
Hot-rolled strip	23.50c.	21.50c.
Cold-rolled strip	30c.	28c.
Drawn wire	25c.	24c.

Straight Chrome

	No. 410	No. 430	No. 442	No. 446
Bars	18.50c.	19c.	22.50c.	27.50c.
Plates	21.50c.	22c.	25.50c.	30.50c.
Sheets	26.50c.	29c.	32.50c.	36.50c.
Hot stp.	17c.	17.50c.	24c.	35c.
Cold stp.	22c.	22.50c.	32c.	52c.

TOOL STEEL

High speed	67c.
High-carbon-chrome	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c a lb. higher.

British and Continental

BRITISH

Per Gross Ton
f.o.b. United Kingdom Ports

Ferromanganese, export	£17 18s.
Tin plate, per base box	32s. to 33s.
Steel bars, open hearth.....	13£ 9s.
Beams, open hearth.....	12£ 2s. 6d.
Channels, open hearth.....	12£ 2s. 6d.
Angles, open hearth.....	12£ 2s. 6d.
Black sheets, No. 24 gage	17£ max.*; 17£ min.**
Galvanized sheets, No. 24 gage	19£ 10s. max.*; 19£ 10s. min.**

* Empire markets only.

** Other than Empire markets.

CONTINENTAL

Per Gross Ton, Belgian Francs
f.o.b. Continental Ports

Bars, merchant	1500
Plates	1750
Joists	1475
Sheets, thin	1900

Above price are minimum base to which 100 francs should be added to cover war risk insurance, freight charges, etc.

RAW MATERIALS PRICES

PIG IRON

No. 2 Foundry

F.o.b. Everett, Mass.	\$24.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa., and Sparrows Point, Md.	24.00
Delivered Brooklyn	26.50
Delivered Newark or Jersey City	25.53
Delivered Philadelphia	24.84
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown ..	23.00
F.o.b. Buffalo	23.00
F.o.b. Detroit	23.06
Southern, delivered Cincinnati ..	23.06
Northern, delivered, Cincinnati ..	23.44
F.o.b. Duluth	23.50
F.o.b. Provo, Utah	21.00
Delivered, San Francisco, Los Angeles or Seattle	26.50
F.o.b. Birmingham*	19.33

* Delivered prices on southern iron for shipment to northern points are 38c. a ton below delivered prices from nearest northern basing point on iron with phosphorus content of 0.70 per cent and over.

Malleable

Base prices on malleable iron are 50c. a ton above No. 2 foundry quotations at Everett, Eastern Pennsylvania furnaces, Erie and Buffalo. Elsewhere they are the same, except at Birmingham and Provo, which are not malleable iron basing points.

Basic

F.o.b. Everett, Mass.	\$23.50
F.o.b. Bethlehem, Birdsboro, Swedeland and Steelton, Pa., and Sparrows Point, Md.	23.50
F.o.b. Buffalo	22.00
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown ..	22.50
Delivered Philadelphia	24.34
Delivered Canton, Ohio	23.89
Delivered Mansfield, Ohio	24.44
F.o.b. Birmingham	18.00

Bessemer

F.o.b. Buffalo	\$24.00
F.o.b. Everett, Mass.	25.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa.	25.00
Delivered Newark or Jersey City	26.53
Erie, Pa., and Duluth	24.00
F.o.b. Neville Island, Toledo, Chicago and Youngstown ..	23.50
F.o.b. Birmingham	24.00
Delivered Cincinnati ..	24.11
Delivered Canton, Ohio	24.89
Delivered Mansfield, Ohio	25.44

Low Phosphorus

Basing points; Birdsboro, Pa., Steelton, Pa., and Buffalo....\$28.50

Gray Forge

Valley or Pittsburgh furnace..\$22.50

Charcoal

Lake Superior furnace\$27.00
Delivered Chicago 30.34

Canadian Pig Iron

Per Gross Ton

Montreal	
Foundry iron	\$27.50 base
Malleable	28.00 base
Basic	27.50 base
Toronto	
Foundry Iron	\$25.50 base
Malleable	26.00 base
Basic	25.50 base

On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.
Per Gross Ton
Domestic, 80% (carload)\$100.00

Spiegeleisen

Per Gross Ton Furnace
Domestic, 19 to 21%\$32.00
Domestic, 26 to 28% 39.50

Electric Ferrosilicon

Per Gross Ton Delivered;
Lump Size

50% (carload lots, bulk)\$69.50*
50% (ton lots, packed) 82.00*
75% (carload lots, bulk)126.00*
75% (ton lots, packed)142.00*

Bessemer Ferrosilicon

F.o.b. Furnace, Jackson, Ohio
Per Gross Ton

10.00 to 10.50%\$32.50
For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.
For each unit of manganese over 2%, \$1 per ton additional.
Base prices at Buffalo are \$1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton

F.o.b. Jackson, Ohio, 5.00 to 5.50%\$27.50
For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.
The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are \$1.25 a ton higher than at Jackson.
Manganese, each unit over 2%, \$1 a ton additional. Phosphorus 0.75% or over, \$1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered
Carlots, Lump Size, on Contract

4 to 6% carbon11.00c.
2% carbon17.50c.
1% carbon18.50c.
0.10% carbon20.50c.
0.06% carbon21.00c.
Spot prices are 1/4c. per lb. of contained chromium higher.

Silico-Manganese

Per Gross Ton, Delivered, Lump
Size, Bulk, on Contract

3% carbon\$98.00*
2.50% carbon103.00*
2% carbon108.00*
1% carbon118.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W del., carload.... \$2.00
Ferrotungsten, 100 lbs. and less 2.25
Ferrovanadium, contract, per lb. contained V., delivered\$2.70 to \$2.90†
Ferracolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., ton lots \$2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace carload and contract per net ton\$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton\$157.50
Ferrophosphorus, electric, or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with \$3 unit-age, freight equalized with Rockdale, Tenn., per gross ton\$58.50
Ferrophosphorus, electrolytic 23-26% in car lots, f.o.b. Monsanto (Siglo), Tenn., 24%, per gross ton, \$3 unit-age, freight equalized with Nashville\$75.00
Ferromolybdenum, per lb. Mo. f.o.b. furnace 95c.
Calcium molybdate, per lb. Mo. f.o.b. furnace 80c.
Molybdenum oxide briquettes 48-52% Mo. per lb. contained Mo. f.o.b. Langeloth, Pa. 80c.

* Spot prices are \$5 per ton higher.
† Spot prices are 10c. per lb. of contained element higher.

*ORES

Lake Superior Ores Delivered Lower Lake Ports

Per Gross Ton
Old range, bessemer, 51.50%\$5.25
Old range, non-bessemer, 51.50% 5.10
Mesaba, bessemer, 51.50% 5.10
Mesaba, non-bessemer, 51.50% .. 4.95
High phosphorus, 51.50% 4.85

Foreign Ores*

C.i.f. Philadelphia or Baltimore,
Exclusive of Duty

Per Unit
Algerian, low P, Cu free, dry, 55 to 58% Fe 14c.
Swedish, low P, 68% Fe 14c.
Swedish, basic or foundry, 65% Fe 12c.
Caucasian, washed, 52% Mn.....Nom.
African, Indian, 44 to 48% Mn.. 46c.
African, Indian, 49 to 51% Mn.. 49c.
Brazilian, 46 to 48% Mn..... 47c.
Cuban, del'd, duty free, 51% Mn 62c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered.\$23.00 to \$23.50
Tungsten, domestic scheelite delivered 23.00 to 23.50
Chrome ore, lump c.i.f. Atlantic Seaboard, per gross ton: South African (low grade)\$19.00
Rhodesian, 45% 22.00
Rhodesian, 48% 26.00 to \$27.00
Turkish, 48-49% 29.00 to 30.00
Turkish, 45-46%Nominal
Turkish, 40-41%Nominal
Chrome concentrates c.i.f. Atlantic Seaboard, per gross ton:
Turkish, 48-49%Nominal

* All foreign ore prices are nominal.

FLUORSPAR

Per Net Ton

Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail\$21.00
Domestic, f.o.b. Ohio River landing barges 21.00
No. 2 lump, 85-5, f.o.b. Kentucky and Ill. mines.\$20.00 to 22.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid\$25.00 to \$26.50
Domestic No. 1 ground bulk, 96 to 98%, calcium fluoride, not over 2 1/2% silicon, f.o.b. Illinois and Kentucky mines....\$31.00
ditto, in bags, f.o.b., same mines\$32.60

FUEL OIL

Per Gal.

No. 3, f.o.b. Bayonne, N. J.....5.10c.
No. 6, f.o.b. Bayonne, N. J..... 3.57c.
No. 5 Bur. Stds., del'd Chicago 3.25c.
No. 6 Bur. Stds., del'd Chicago 2.75c.
No. 3 distillate, del'd Cleve'd. 5.25c.
No. 4 industrial, del'd Cleve'd. 5.00c.
No. 5 industrial, del'd Cleve'd. 4.25c.
No. 6 industrial, del'd Cleve'd. 3.875c.

COKE

Per Net Ton

Furnace, f.o.b. Connells-ville, Prompt\$4.00 to \$4.25
Foundry, f.o.b. Connells-ville, Prompt 5.25 to 5.50
Foundry, by - product Chicago ovens 10.50
Foundry, by - product del'd New England.... 12.50
Foundry, by - product del'd Newark or Jersey City11.38 to 11.90
Foundry, by - product Philadelphia 11.13
Foundry, by - product delivered Cleveland ... 11.05
Foundry, by - product delivered Cincinnati .. 10.50
Foundry, Birmingham.. 7.50
Foundry, by - product del'd St. Louis industrial district10.75 to 11.00
Foundry, from Birmingham, f.o.b. cars dock Pacific ports 14.75

IRON AND STEEL WAREHOUSES

PITTSBURGH*

	Base per Lb.
Plates	3.40c.
Shapes	3.40c.
Soft steel bars and small shapes	3.35c.
Reinforcing steel bars	2.70c.
Cold finished bars and screw stock	3.65c.
Hot rolled strip	3.60c.
Hot rolled sheets	3.35c.
Galv. sheets (24 ga.) 500 lb. to 1499 lb.	4.75c.
Wire, black, soft annealed....	3.30c.
Wire, galv., soft	3.55c.
Track spikes (1 to 24 kegs)....	3.60c.
Wire nails (in 100-lb. kegs)...	2.80c.

On plates, structurals, bars, strip and hot rolled sheets, base applied to orders of 400 to 1999 lb. On reinforcing bars base applies to orders of less than one ton and includes switching and starting charge.

All above prices for delivery within the Pittsburgh switching district.

NEW YORK

	Base per Lb.
*Plates, ¼ in. and heavier....	3.76c.
*Structural shapes	3.75c.
*Soft steel bars, round	3.84c.
Iron bars, Swed. charcoal	9.50c.
**Cold-fin. shafting and screw stock:	
Rounds, squares, hexagons	4.09c.
Flats up to 12 in. wide....	4.09c.
Cold-rolled strip soft and quarter hard	3.51c.
*Hot-rolled strip, soft O.H....	3.96c.
*Hot-rolled sheets	3.43c.
Galv. sheets (24 ga.)	4.50c.
Cold-rolled sheets (20 ga.)	
Standard quality	4.60c.
Deep drawing	4.85c.
Stretcher leveled	5.10c.
SAE, 2300, hot-rolled	7.35c.
SAE, 3100, hot-rolled	5.90c.
SAE, 6100, hot-rolled annealed.	8.75c.
SAE, 2300, cold-rolled	8.59c.
SAE, 3100, cold-rolled, annealed	8.19c.
*Floor plate, ¼ in. and heavier	5.56c.
Standard tool steel	12.50c.
Wire, black, annealed	4.85c.
Wire, galv. (No. 9)	4.70c.
O. H. spring steel, flats....	4.70c.
Common wire nails, per keg....	\$2.85

*For lots 400 to 1999 lb.

**For lots less than 1500 lb.

CHICAGO

	Base per Lb.
Plates and structural shapes..	3.55c.
Soft steel bars, rounds and angles	3.50c.
Soft steel squares, hexagons, channels and Tees	3.65c.
Hot rolled strip	3.60c.
Floor plates	5.15c.
Hot rolled sheets	3.35c.
Galvanized sheets	4.60c.
Cold rolled sheets	4.30c.
Cold finished carbon bars....	3.75c.

Above prices are subject to deductions and extras for quantity and are f.o.b. consumer's plant within Chicago free delivery zone.

CLEVELAND

	Base per Lb.
Plates	3.40c.
Structural shapes	3.58c.
Soft steel bars	3.25c.
Cold-fin. bars (1500 lb., over.)	3.75c.
Hot-rolled strip	3.50c.
Cold rolled sheets	4.05c.
Cold-finished strip	3.20c.
Galvanized sheets (No. 24)....	4.72c.
Hot-rolled sheets	3.35c.
Floor plates, 3/16 in. and heavier	5.18c.
Black ann'd wire, per 100 lb.	\$3.10
No. 9 galv. wire, per 100 lb....	3.50
Com. wire nails, base per keg	2.75
Hot rolled alloy steel (3100)...	5.85c.
Cold rolled alloy steel (3115)...	6.75c.

Prices shown on hot rolled bars, strip, sheets, shapes and plates are for 400 to 1999 lbs. Alloy steel, 1000 lb. and over; galvanized sheets, 150 to 1499 lb.; cold rolled sheets, 400 to 1499 lb.

ST. LOUIS

	Base per Lb.
Plates and structural shapes..	3.47c.
Bars, soft steel (round and flats)	3.62c.
Bars, soft steel (squares, hexagons, ovals, half ovals and half rounds)	3.77c.
Cold fin. rounds, shafting, screw stock	4.02c.
Galv. sheets (24 ga.)	4.52c.
Hot rolled sheets	3.38c.
Galv. corrugated sheets, 24 ga. and heavier*	4.57c.
Structural rivets	5.02c.

* No. 26 and lighter take special prices.

BOSTON

	Base per Lb.
Structural shapes, 3 in. and larger	3.85c.
Plates, ¼ in. and heavier....	3.85c.
Bars	3.88c.
Heavy hot rolled sheets....	3.71c.
Hot rolled sheets	4.21c.
Hot rolled annealed sheets....	4.61c.
Galvanized sheets	4.61c.
Cold rolled sheets	4.71c.

The following quantity differentials apply: Less than 100 lb., plus \$1.50 per 100 lb.; 100 to 399 lb. plus 50c.; 400 to 1999 lb. base; 2000 to 9999 lb. minus 20c.; 10,000 to 39,999 lb. minus 30c.; 40,000 lb. and over minus 40c.

BUFFALO

	Base per Lb.
Plates	3.62c.
Floor plates	5.25c.
Struc. shapes	3.40c.
Soft steel bars	3.35c.
Reinforcing bars (20,000 lb. or more)	2.15c.
Cold-fin. flats, squares, rounds, and hex.	3.65c.
Hot-rolled sheets, 3/16 x 14 in. to 48 in. wide incl., also sizes No. 8 to 30 ga.	3.35c.
Galv. sheets (24 ga.)	4.70c.
Bands and hoops	3.82c.

NEW ORLEANS

	Base per Lb.
Mild steel bars	4.20c.
Reinforcing bars	3.24c.
Structural shapes	4.10c.
Plates	4.10c.
Hot-rolled sheets, No. 10....	4.35c.
Steel bands	4.75c.
Cold-finished steel bars	5.10c.
Structural rivets	4.85c.
Bolter rivets	4.85c.
Common wire nails, base per keg	3.55
Bolts and nuts, per cent off list	60

REFRACTORIES PRICES

Fire Clay Brick

	Per 1000 f.o.b. Works
Super-duty brick, at St. Louis.	\$60.80
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey....	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey....	49.00
No. 1 Ohio	39.90
Ground fire clay, per ton.....	7.10

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	\$47.50
Chicago District	55.10
Birmingham	47.50
Silica cement per net ton (Eastern)	8.55

Chrome Brick

	Net per Ton
Standard f.o.b. Baltimore, Plymouth Meeting and Chester....	\$50.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	50.00

Magnesite Brick

	Net per Ton
Standard f.o.b. Baltimore and Chester	\$72.00
Chemically bonded, f.o.b. Baltimore	61.00

Grain Magnesite

	Net per Ton
Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)....	(—)*
Domestic, f.o.b. Baltimore and Chester in sacks	40.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

* None available.

PHILADELPHIA

	Base per Lb.
*Plates, ¼ in. and heavier ...	3.55c.
*Structural shapes	3.55c.
*Soft steel bars small shapes, iron bars (except bands)....	3.85c.
†Reinforc. steel bars, square and deformed	2.76c.
Cold-finished steel bars	4.16c.
*Steel hoops	4.35c.
*Steel bands, No. 12 and 3/16 in. incl.	3.85c.
*Spring steel	5.00c.
*Hot-rolled anneal. sheets ...	3.55c.
†Galvanized sheets (No. 24)...	4.75c.
*Diam. pat. floor plates, ¼ in.	5.25c.

*For quantities between 400 and 1999 lb.

†For 10 bundles or over.

‡For one to five tons.

BIRMINGHAM

	Base per Lb.
Bars and bar shapes	3.50c.
Structural shapes and plates..	3.55c.
Hot rolled sheets No. 10 ga....	3.35c.
Galvanized sheets No. 24 ga....	4.75c.
Strip	3.60c.
Reinforcing bars	3.50c.
Floor plates	5.88
Cold finished bars	4.43
Machine and carriage bolts	50 & 10 off list
Rivets (structural) \$4.60 base	
On plates, shapes, bars, hot-rolled strip, heavy hot-rolled sheets, the base applies on 400 to 1999 lb. All prices are f.o.b. consumer plant.	

PACIFIC COAST

	San Francisco	Los Angeles	Seattle
Plates, tanks and U. M.	3.35c.*	3.80c.	3.40c.
Shapes, standard	3.35c.*	3.80c.	3.50c.
Soft steel bars..	3.50c.	3.50c.	4.00c.
Reinforcing bars, f.o.b. cars dock			
Pacific ports	2.525c.	open.	2.975c.
Hot-rolled sheets (No. 10)	3.40c.	4.10c.	3.70c.
Galv. sheets (No. 24 and lighter)	5.15c.	5.00c.	4.75c.
Galv. sheets (No. 22 and heavier)	5.40c.	5.00c.	4.75c.
Cold-finished steel			
Rounds	6.80c.	6.60c.	7.00c.
Squares and hexagons ...	8.05c.	7.85c.	8.25c.
Flats	8.55c.	8.35c.	8.25c.
Common wire nails—base per keg less carload	3.25c.	3.25c.	3.15c.

* Plates over 1 in. and shapes over 6 in. are 25c. per 100 lb. higher.

All items subject to differentials for quantity.

ST. PAUL

	Base per Lb.
Mild steel bars, rounds.....	4.10c.
Structural shapes	4.00c.
Plates	4.00c.
Cold-finished bars	4.83c.
Hot-rolled annealed sheets, No. 24	4.75c.
Galvanized sheets, No. 24....	5.00c.

On mild steel bars, shapes and plates the base applies on 400 to 14,999 lb. On hot-rolled sheets, galvanized sheets and cold-rolled sheets base applies on 15,000 lb. and over. Base on cold-finished bars is 1000 lb. and over of a size.

DETROIT

	Base per Lb.
Soft steel bars	3.43c.
Structural shapes	3.65c.
Plates	3.60c.
Floor plates	5.27c.
Hot-rolled sheets, 8 to 30 gages above 12 in. and 3/16 in., 24 in. to 48 in. wide.....	3.43c.
Cold-rolled sheets	4.50c.
*Galvanized sheets	4.84c.
Hot rolled strip, under 12 gage	3.68c.
Hot rolled strip, above 12 gage	3.43c.
Cold-finished bars	3.80c.
Cold-rolled strip	3.40c.
Hot-rolled alloy steel (SAE 3100 Series)	5.97c.
Cold-rolled alloy (SAE 2300)...	8.45c.

Quantity extras apply to all items.

*Price applies only in metropolitan Detroit.

THIS WEEK'S MACHINE ... TOOL ACTIVITIES ...

... Gain in domestic demand reported by Cincinnati builders ... Orders have been slower at Cleveland ... Chicago dealers doing brisk business, but not much future business in sight ... Production still at factory capacity.

More Strength Seen In Domestic Demand

CINCINNATI—Small downward fluctuation in lathe demand during the past week pushed the local machinery market fractionally off from previous levels. A lesser foreign business appears to be the sole cause, since domestic ordering is without appreciable change. In fact, manufacturers generally indicate more strength to the domestic demand with a brisk flow of inquiry. Milling machine and grinder ordering continues to be a feature of the present market. Other types of tools also continue to be encouragingly active, with the heavier machines holding well to current levels. French and British purchasing is most active from export sources, although some business from Japan and Russia is reported.

Production is still at factory capacity. One manufacturer, now "farming out" considerable work, indicates that his outstanding problem still is where to find available manufacturing space. On this basis, there is not much likelihood of improvement in the delivery situation, with shipments being gradually forced to longer periods.

Detroit Tool and Die Program Starts Earlier Than Usual

DETROIT—An earlier start on tool and die work will make it possible for the industry to remain active for a longer period than usual, offering reason for belief that the industry will be able to accomplish all of the programs laid out for it without undue crowding. This assurance, given in the last week by spokesmen for the industry, allays fears that some automotive programs might be in danger of delays. Some tool work incident to the production of the new Ford car has already been placed, it is learned. Machine tool business continues on a broad base, but with activity a trifle spotty.

Chicago Orders at High Level; Inquiries Much Lower

CHICAGO—March has started out like a lion as regards machine tool orders, according to some Chicago sales representatives. In one office, March bookings to date are already double all of February's business. Business is well diversified, both as to type of machine and to number of customers. Some concern is being felt, however, because of the fact that the orders now coming in are

from quotations made some time ago and that the number of inquiries quoted upon and still not closed is fast dwindling. New inquiries are not as numerous as sellers would like to have them.

Sellers of used and rebuilt machine tools are experiencing a rather difficult period, in that business from week to week is fluctuating widely and following no set pattern whatsoever. Inquiries for this type equipment are numerous, however.

Orders Slower, Cleveland Builders Report

CLEVELAND — Single machine inquiries continue to come out in this district but actual orders have been slower during the past week. Prospects include several pieces of equipment for the Chesapeake & Ohio railroad shops, a manufacturer of speed nuts, a brush manufacturer, a machine tool producer and several plants of an electrical manufacturing company.

Airplane manufacturers and machine tool producers have endeavored during the past week to iron out numerous problems and arrange quicker deliveries for a few plants where equipment is understood to be desired immediately.

There is not much new to report in regard to the lists drawn up by automotive companies in connection with proposed 1941 model changes. The automotive industry evidently will find it necessary to allow generously for delayed deliveries or to revamp considerable of its present equipment.

... PIPE LINES ...

Southern Minerals Corp., Mineral Wells, Tex., has approved plans for new welded steel pipe lines from oil fields in San Patricio and Aransas Counties for crude oil transmission to connection with main pipe line system; also steel pipe line gathering systems in oil field districts noted. Work will be carried out by company forces. Cost close to \$90,000 with booster pumping stations and other operating facilities.

Nacogdoches, Tex., plans pressure pipe lines for municipal natural gas distributing system, including main welded steel pipe line for connection with supply source. Special election has been called on April 2 to approve project, to cost about \$150,000 with control station, meter house and other operating facilities. Bonds will be provided in that amount. H. G. Stallings is city engineer.

Metropolitan Water District, 306 West Third Street, Los Angeles, will take bids soon for 24 to 38-in. steel pipe line for main feeder in Orange County, about 27 miles in all, with branch line to Anaheim, Cal., approximately

3700 ft. long. It is proposed to specify pipe with spun mortar lining and to ask alternate bids on precast concrete pipe.

United States Engineer Office, Missouri River Division, Davidson Building, Kansas City, Mo., will take bids soon for steel penstocks for power dam and hydroelectric generating station at Fort Peck, Mont.

Southeastern Pipe Line Co., Forsyth Building, Atlanta, Ga., a joint interest of Pure Oil Co., Chicago, and Gulf Refining Co., Pittsburgh, has let contract to Williams Brothers Corp., National Bank of Tulsa Building, Tulsa, Okla., for new 8-in. welded steel pipe line from Port St. Joe, Fla., to Atlanta, Ga., supplementing award recently made to same company for 6-in. welded steel pipe line from Atlanta to point on Georgia line, near Chattanooga, Tenn., previously noted in these columns and now in progress. Lines will make connection at Atlanta, where large pumping station will be located. Other pumping plants will be constructed at Port St. Joe; Bainbridge, Americus and Macon, Ga. Entire system will be about 456 miles long and will be used for gasoline transmission from Port St. Joe, where unloading station and bulk plant will be located on waterfront, receiving gasoline in tankers from oil refineries on Gulf of Mexico for transmission through pipe line system. Entire line will be electrically welded, with complete system estimated to cost about \$5,000,000 including terminal plants at Atlanta and point near Chattanooga, noted.

White & Mitchell, Cambridge Springs, Pa., H. F. White, Cambridge Springs, head, plans steel pipe line system for natural gas distribution in that municipality, including main welded steel pipe line for connection with supply source, control station and other operating facilities.

Inspiration Consolidated Copper Co., Miami, Ariz., has begun work on new 12-in. steel pipe line from Pringle Ranch to Kiser pumping station, near mining properties at Inspiration, vicinity of Miami, about 11 miles, for which contract recently was let to Fisher Contracting Co., 516 South Seventh Street, Phoenix, Ariz. It will be used for increased water supply for mining operations.

Bureau of Reclamation has awarded 2,040,000 ft. of 1-in. outside diameter black steel pipe for cooling system at Friant Dam, Central Valley project, Cal., to National Electric Products Corp., Pittsburgh.

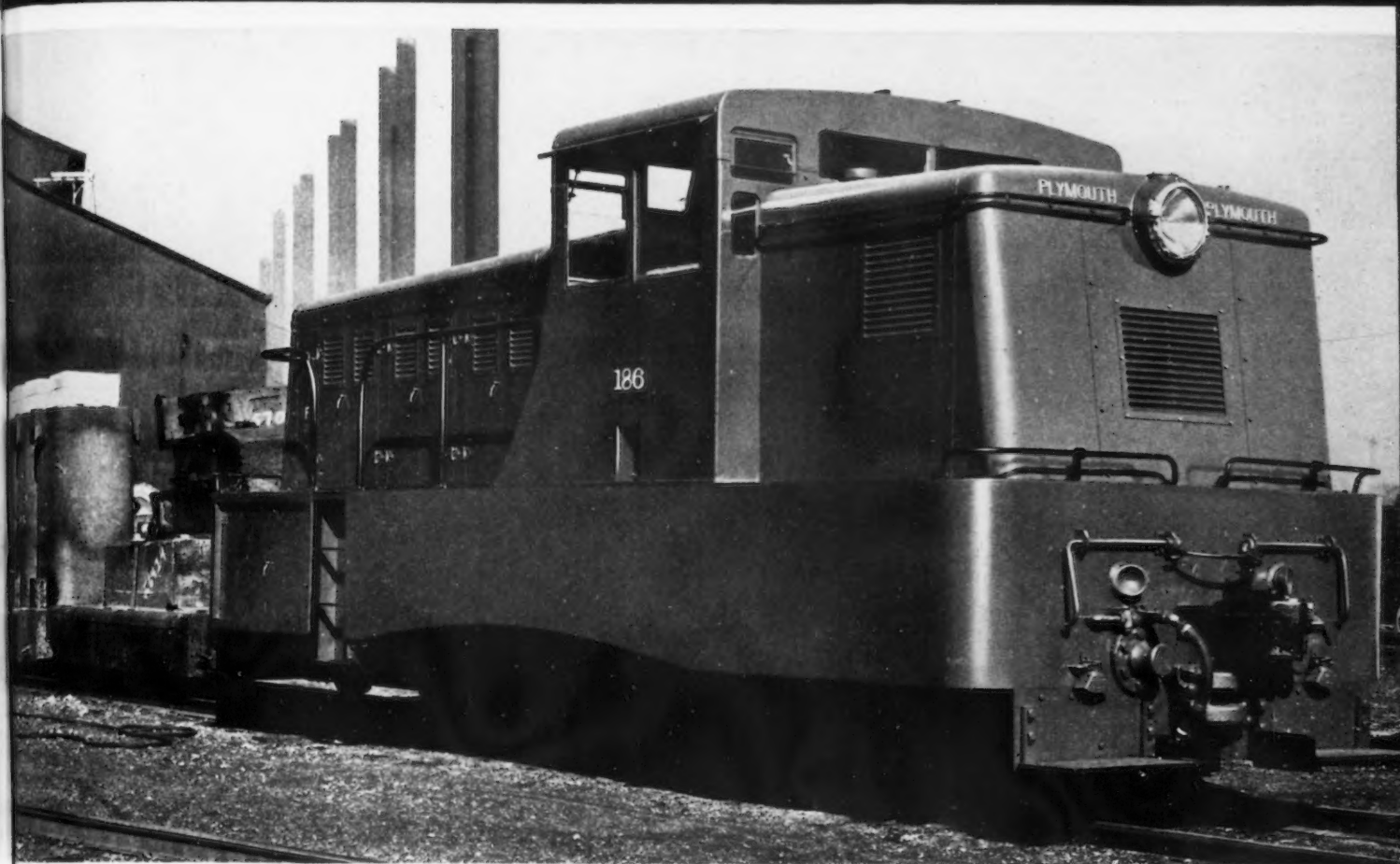
Machinery Credit Executives Plan Toronto Meeting

CREDIT executives of the machinery and supplies industry will gather at the Royal Oak Hotel, Toronto, Canada, May 19-23 for the 45th annual credit congress of the National Association of Credit Men. Members of the Canadian Credit Men's Trust Association, Ltd., will participate.

In addition to general sessions, individual industry meetings are planned, these to be held in the afternoon on May 21 and 22. The committee in charge of the machinery and supplies industry program includes: R. H. Ryan, Pratt & Whitney Co., Hartford, Conn., chairman; W. Jeannes, Canadian Fairbanks Morse, Ltd., Toronto; J. V. Marron, Yale & Towne Mfg. Co., Philadelphia; Oscar Iber, O. Iber Co., Chicago; W. T. Siddall, Brown & Sharpe Mfg. Co., Chicago; and E. B. Gausby, Warner & Swasey Co., Cleveland.

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PLANT EXPANSION AND EQUIPMENT BUYING

◀ NORTH ATLANTIC ▶

International Nickel Co., 67 Wall Street, New York, plans expansion and improvements in branch plant at Huntington, W. Va., including new furnace unit for normalizing service, plating tanks, cranes, conveyors and other mechanical equipment. Cost close to \$125,000 with equipment.

St. Regis Paper Co., 230 Park Avenue, New York, has let general contract to Enos Construction Co., Herkimer, N. Y., for two-story addition to mill at Deferiet, N. Y., 75 x 150 ft. Cost over \$65,000 with equipment.

Commanding Officer, Ordnance Department, Watervliet Arsenal, Watervliet, N. Y., asks bids until April 2 for one drill grinder, two tool grinders, one carbide tool grinder, one center lapping machine and one tap tool grinder (Circular 495).

Socony-Vacuum Oil Co., 26 Broadway, New York, plans expansion in oil refinery at Beaumont, Tex., operated by Magnolia Petroleum Co., a subsidiary. Cost over \$500,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until March 19 for eight portable shockproof x-ray machines (Schedule 972) for Brooklyn Navy Yard; seamless copper tubing (Schedule 970), 48 ventilation equipments, with motors, controllers and spare parts (Schedule 987) for Brooklyn and Philadelphia yards; 600 arc welding control panels (Schedule 977) for Philadelphia yard.

R. H. Macy & Co., Broadway and Thirty-fourth Street, New York, department store, have leased three and five-story buildings at 184-10 Jamaica Avenue, Jamaica, L. I., about 106,000 sq. ft. of floor space, for new plant for manufacture, packaging, storage and distribution of food products, drugs, cosmetics and allied specialties. New automatic machinery and processing equipment will be installed, with conveyors, loaders, and other mechanical-handling facilities.

Quartermaster Corps, Office of Constructing Quartermaster, Mitchel Field, Hempstead, L. I., asks bids until March 20 for gray iron castings (Circular 6201-33).

Linde Air Products Co., 30 East Forty-second Street, New York, has let general contract to Lindgren & Swinerton, Inc., 605 West Olympic Boulevard, Los Angeles, for new one and two-story factory branch, storage and distributing plant at Los Angeles. Cost close to \$50,000 with equipment.

Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, Brooklyn, asks bids until March 18 for one precision bench lathe, milling attachment, milling arbor, lathe dogs, boring bars, cutting-off tools, drill chuck and other equipment (Circular 325).

Aircraft Engineering Products, Inc., Clifton, N. J., has leased former one-story local Dundee Silk Mill, about 20,000 sq. ft. of floor space, for new plant.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids until March 19 for brass rims (castings) for powder tanks (Circular 1219); until March 27, two boil tubs and agitators (chrome nickel steel fabrication) (Circular 1203).

Freihofer Baking Co., Twenty-seventh Street and Indiana Avenue, Philadelphia, has let general contract to Henry P. Schneider, 3713 York Road, for new one-story baking plant, 100 x 200 ft., with section 86 ft. high. Cost about \$100,000 with mixers, conveyors, traveling ovens, loaders and other equipment.

Armstrong Cork Co., Liberty Street, Lancaster, Pa., plans one-story addition to branch plant at Millville, N. J., 175 x 200 ft. Cost over \$80,000 with equipment.

Purchasing and Contracting Officer, Air Corps, Middletown Air Depot, Middletown, Pa.,

asks bids until March 19 for one motor-driven threader and cutter (Circular 11).

◀ BUFFALO DISTRICT ▶

Buffalo Niagara Electric Corp., Electric Building, Buffalo, plans one-story equipment storage and distributing building, with service and garage unit, shops, laboratory addition and other structures. Cost close to \$100,000 with equipment.

Moore Steam Turbine Division of Worthington Pump & Machinery Corp., Wellsville, N. Y., will make alterations in power house, with installation of coal-burning equipment to replace present gas-fired equipment.

◀ NEW ENGLAND ▶

Commanding Officer, Ordnance Department, Springfield Armory, Springfield, Mass., asks bids until March 19 for two automatic profiling machines (Circular 300); until March 20, parts for automatic pistols. Circular 305); until March 21, one multiple machining unit, indexing station machine (Circular 314).

Coca-Cola Bottling Co., 466 Chapel Street, New Haven, Conn., has asked bids on general contract for one and two-story mechanical-bottling, storage and distributing plant. Cost close to \$200,000 with equipment. Jesse M. Shelton, Bona Allen Building, Atlanta, Ga., is architect and engineer.

Robert Gair Co., 155 East Forty-fourth Street, New York, fiber containers, floor display stands, etc., has acquired land at Portland, Conn., for erection this spring of one-story 80,000 sq. ft. branch plant. Cost over \$135,000 with machinery.

Commanding Officer, Ordnance Department, Watertown Arsenal, Watertown, Mass., asks bids until March 21 for one horizontal boring, milling and drilling machine, 6-in. spindle, table type (Circular 400).

◀ WASHINGTON DIST. ▶

Purchasing and Contracting Officer, Holabird Quartermaster Depot, Baltimore, asks bids until March 19 for tool brackets, shovels, axes and other tools (Circular 398-157).

Public Works Officer, Naval Operating Base, Norfolk, Va., asks bids until March 20 for one 125,000-gal. fuel oil tank, 27 ft. diameter, and 30 ft. high (Specification 9498).

General Purchasing Officer, Panama Canal, Washington, asks bids until March 18 for 32,000 ft. of galvanized wire rope, 52,000 ft. of wire rope, 101,000 ft. of plow steel wire rope, 3000 ft. of galvanized steel guy wire, 55,000 lb. of soft steel wire, 95,000 ft. of brass pipe, 5000 ft. of copper tubing, 215,000 lb. of steel wire nails, 46,000 lb. of galvanized steel wire nails, 10,000 lb. of galvanized steel wire roofing nails, 10,000 lb. of galvanized iron or steel flooring nails, 900 lb. of steel wire brads, 500 galvanized pipe hangers (Schedule 3930); until March 20, four steel buoyancy tank units (Schedule 3948); until March 21, four 2½-ton grab buckets (Schedule 3937).

Virginia Public Service Co., Charlottesville, Va., has let general contract to Doyle & Russell, Central National Bank Building, Richmond, Va., at \$350,000 for foundations and superstructure for addition to steam-electric generating plant at Alexandria, Va. Installation will include 15,000-kw. turbine-generator, high-pressure boilers and auxiliary equipment, for which separate awards are being made. Entire project will cost about \$2,000,000.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until March 19 for one combination burring, turning, wiring, beading, crimping and flanging machine for sheet metal, with motor and starter (Schedule 969), power-operated steel forming press (Schedule 967), hand-operated metal box

and pan brake (Schedule 968); until March 22, motor-driven shearing and squaring machine (Schedule 953), motor-driven jig borer, with equipment (Schedule 954), transfer valve sets (Schedule 900-3176) for Eastern and Western yards; two motor-driven tool room machines (Schedule 980) for Sewall's Point, Va., and Eastern yard.

◀ SOUTH ATLANTIC ▶

Railway Supply & Mfg. Co., 1609 North Brevard Street, Charlotte, N. C., plans two-story addition for storage and distribution. Cost about \$45,000 with equipment.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until March 27 for steel hangar for naval air station, Key West, Fla. (Specifications 955).

Charlotte Pepsi-Cola Bottling Co., Inc., 105 East Kingston Avenue, Charlotte, N. C., will ask bids soon on general contract for mechanical-bottling, storage and distributing plant, consisting of two one-story units, 65 x 120 ft., for main production, and 60 x 120 ft., for general service, shop and garage. Cost close to \$70,000 with equipment. M. R. Marsh, Builders' Building, is architect.

◀ SOUTH CENTRAL ▶

United Gas Pipe Line Co., Duncanville Highway, Dallas, Tex., has approved plans for new natural gasoline plant at Koran, La., near Lake Bistineau. It will include compressor station, boiler house, water pumping station, cooling tower, storage and distributing buildings, laboratory and other structures. About 17 welded steel storage tanks will be installed. Cost estimated at \$450,000 with equipment, pipe lines and terminal facilities at bulk loading station.

Director of Purchases, Tennessee Valley Authority, Knoxville, Tenn., asks bids until March 19 for segmental valves and bulkhead recess seals for navigation lock, Watts Bar dam; until March 27, three hydraulic turbines and governors (Units Nos. 1, 2 and 3), for Watts Bar hydroelectric power plant.

Nashville Coal Co., Stahlman Building, Nashville, Tenn., plans new coal carbonization plant, including power house, machine shop and auxiliary structures. Cost about \$600,000 with machinery. Company is arranging RFC loan in that amount for project.

◀ SOUTHWEST ▶

Monsanto Chemical Co., 1700 South Second Street, St. Louis, has let general contract to Fruin-Colnon Contracting Co., Merchants Laclede Building, for one-story addition, 60 x 135 ft., for storage and distribution. Cost close to \$50,000 with equipment.

Blanton Co., 318 South Second Street, St. Louis, food products, has let general contract to Hercules Construction Co., 8808 Ladue Road, for new plant. Cost about \$400,000 with processing machinery, mechanical-handling and other equipment. W. J. Knight & Co., Wainwright Building, are architects and engineers.

Missouri Power & Light Co., Kansas City, Mo., plans expansion and improvements in steam-electric power plant at Brookfield, Mo., including new 5000-kw. turbine-generator unit, high-pressure boilers and auxiliary equipment. Cost close to \$500,000.

Eastern Air Lines, San Antonio, Tex., has let general contract to Hollingsworth Construction Co., San Antonio, for new hangar at local Stinson Field, 110 x 130 ft., with shop and reconditioning facilities. Cost close to \$45,000 with equipment.

Lufkin Foundry & Machine Co., Lufkin, Tex., has let general contract to Mosher Steel Co., Dallas, Tex., for one-story plant, 150 x 260 ft. Cost close to \$75,000 with equipment.

◀ WESTERN PA. DIST. ▶

Conewango Refining Co., Warren, Pa., has approved plans for extensions and improvements in oil refinery, including new processing and other equipment. Cost close to \$50,000 with machinery.

Logan County Coal Co., Slagle, W. Va., plans rebuilding tippie at coal-mining prop-

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erties, recently destroyed by fire. Loss over \$75,000 with machinery.

◀ OHIO AND INDIANA ▶

Hydraulic Press Mfg. Co., Lincoln Avenue, Mount Gilead, Ohio, plans one-story addition for expansion in machine works. Cost close to \$300,000 with equipment. Austin Co., Cleveland, is engineer.

Pepsi-Cola Bottling Co., 1738 East Thirtieth Street, Cleveland, has plans for one-story mechanical-bottling plant, 150 x 210 ft., with storage and distributing facilities. Cost close to \$50,000 with equipment. Joseph Burke, 1983 East Twenty-fourth Street, is engineer.

Cleveland Pneumatic Tool Co., 3734 East Seventy-eighth Street, Cleveland, has let general contract to Sam W. Emerson Co., 1836 Euclid Avenue, for one and two-story addition. Cost over \$85,000 with equipment. Ernest McGeorge, 9400 Quincy Avenue, is architect and engineer.

Contracting Officer, Materiel Division, Air Corps, Wright Field, Dayton, asks bids until March 19 for engine control valve assemblies, hydraulic engine control cylinders and hydraulic engine control cylinder assemblies (Circular 1190); until March 20 for rivets (Circular 1161), vertical lift doors (Circular 1137); until March 21, motor-driven pipe-threading and cutting machine (Circular 1184), 25,000 gaskets (Circular 1174), galvanized conduit, rubber insulated cable, 40,000 ft. of rubber-covered supercharging wire (Circular 1185); until March 22, electrical connector plug and socket assemblies, etc. (Circular 1180); until March 25, 50 fuel pump drive coupling assemblies (Circular 1187).

Sunbeam Electric Mfg. Co., Read Street and Morgan Avenue, Evansville, Ind., automobile headlights, asks bids until March 18 for power house equipment, including two 400-hp. watertube boilers, two forced-draft traveling grate stokers, soot blowers, etc. Bevington-Williams, Inc., Indiana Pythian Building, Indianapolis, is consulting engineer.

◀ MICHIGAN DISTRICT ▶

Saginaw Steering Gear Division, General Motors Corp., Saginaw, Mich., will take bids soon on general contract for one-story addition, 150 x 160 ft. Cost close to \$100,000 with equipment. Frantz & Spence, Saginaw, are architects.

Solvay Process Co., West Jefferson Avenue and Solvay Street, Detroit, plans extensions and improvements in steam power house. Cost close to \$40,000 with equipment.

Superior Tool & Die Co., 6633 Rohns Street, Detroit, plans one-story plant at Charlotte, Mich. Cost close to \$65,000 with equipment. Austin Co., Cleveland, is engineer.

◀ MIDDLE WEST ▶

International Harvester Co., 180 North Michigan Avenue, Chicago, will take bids soon on general contract for one-story addition, 393 x 770 ft., to branch plant at East Moline, Ill., providing about 290,000 sq. ft. of manufacturing space for expansion. Cost about \$1,000,000 with machinery. Bids also will be asked for one-story office and operating building at same works, about 24,000 sq. ft. of floor space. Cost about \$185,000. James D. McGann is superintendent of building, first noted address.

Union Machinery Co., 109 West Van Buren Street, Joliet, Ill., wrapping machinery and parts, has let general contract to Hansen & Peterson Co., 204 South Desplaines Street, for one-story addition, 65 x 100 ft. Cost over \$40,000 with equipment.

Commanding Officer, Ordnance Department, Rock Island Arsenal, Rock Island, Ill., asks bids until March 18 for two automatic chucking and turning machines (Circular 732), metal-cutting and sawing machine, with hydraulic feed (Circular 733).

Kimberly-Clark Corp., North Commercial Street, Neenah, Wis., will soon begin erection of two-story and basement addition, 75 x 240 ft., to paper mill. Cost over \$100,000 with equipment.

Nash-Kelvinator Corp., Nash Division, Kenosha, Wis., plans one-story addition, 240 x 250

ft., for expansion in machine works. Cost over \$175,000 with equipment.

United States Engineer Office, Commerce Building, St. Paul, Minn., asks bids until March 19 for one oil engine-operated crawler-type crane (Circular 39).

Waterloo Valve Spring Compressor, Inc., 1406 East Fourth Street, Waterloo, Iowa, plans one-story factory, 60 x 100 ft. Nicholas Sulentic, president, is in charge.

Steel Craft Corp., Burlington, Iowa, steel products, has let general contract to Carl A. Nelson, Burlington, for two-story and basement plant, 50 x 150 ft. Oven unit, presses, welding equipment and other machinery will be installed. Cost about \$45,000 with equipment.

◀ PACIFIC COAST ▶

General Motors Corp., Detroit, has asked bids on general contract for one-story addition to assembling shops at South Gate, Los Angeles, about 150 x 900 ft., for storage and distribution. Cost over \$175,000 with equipment. Albert Kahn, Inc., New Center Building, Detroit, is architect and engineer.

American Smelting & Refining Co., Federated Metals Division, Stuart and Folsom Streets, San Francisco, has let general contract to Cahill Brothers, 206 Sansome Street, for four-story addition, 25 x 50 ft. Cost over \$60,000 with equipment. W. H. Baker, Jr., 201 First Street, is consulting engineer.

Purchasing Officer, Department of Interior, Washington, asks bids until March 18 for one tilting concrete mixer, side discharge, mounted on two steel-tired steel wheels, not less than 3½ cu. ft. capacity, for Death Valley Junction, Cal. (Circular 5917).

Los Angeles Water and Power Bureau, 205 South Broadway, Los Angeles, asks bids on general contract until March 21 for three-story electrical repair shop, 120 x 180 ft. A crane runway will be installed. Cost about \$350,000 with equipment.

Richfield Oil Corp., 555 South Flower Street, Los Angeles, and 901 Harrison Street, Seattle, plans new bulk oil marine terminal on West Duwamish Waterway and West Lander Street, Seattle, including wharf, pumping station, steel storage tanks and other structures. Cost about \$300,000 with equipment. J. J. Downey is company engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until March 22 for one motor-driven, self-contained welding table and positioner (Schedule 941), two hydraulic elevators, with spare parts (Schedule 947) for Puget Sound Navy Yard; until March 26, one 36-in. band saw, sash, door and cabinet, tenon machine, with cut-off attachment; wood-boring machine, all with motor, control and wrenches (Schedule 971), 5000 steel oilers and 300 steel oil fillers (Schedule 935), wire boiler tube brush sections, and wire bristle boiler tube brushes and refills (Schedule 982) for Mare Island yard.

◀ CANADA ▶

Consolidated Mining & Smelting Co. of Canada, Ltd., Montreal, will start work on 4000-hp. hydro-electric plant in Yellowknife section of Northwest Territories, as soon as Dominion Government grants a permit. Contract has been awarded to Bennett & White Construction Co., Ltd., Calgary, Alta. Cost \$600,000.

Canadian Celanese, Ltd., Drummondville, Que., will build addition to plant to cost \$1,000,000. P. A. Thompson is director.

Wynne-Roberts, Son & McLean, 67 Yonge Street, Toronto, are engineers in connection with 5,000,000 gal. per day waterworks pumping unit at Chatham, Ont. W. R. Foreman, City Hall, is clerk.

Dominion Foundries & Steel, Ltd., Hamilton, Ont., has awarded contract to Frid Construction Co., Ltd., 128 King Street East, for addition to foundry, plate mill and other buildings involved in \$1,000,000 plant expansion program. Canadian Engineering & Contracting Co., Ltd., 25 Hughson Street South, is contractor for machine shop building.

Steel Co. of Canada, Ltd., Hamilton, Ont., has awarded structural steel contract for

\$500,000 tin plate mill to Hamilton Bridge Co., Ltd. Tope Construction Co., 677 Main Street, is contractor.

John Inglis Co., Ltd., 14 Strachan Avenue, Toronto, has awarded structural steel contract to Dominion Bridge Co., Ltd., 1139 Shaw Street, and reinforcing steel contract to Dominion Reinforcing Steel Co., Ltd., 57 Bloor Street West, for new ordnance building.

Canadian War Supply Board, Ottawa, has received tenders for construction of seven hangars and central repair depot at Trenton Air Station, Trenton, Ont., to cost \$325,000.

Fairchild Aircraft, Ltd., Longueuil, Que., will start work soon on plant addition to cost about \$100,000.

Noorduyn Aviation, Ltd., Montreal, is offering \$500,000 5½ per cent, 10-year convertible sinking fund notes to provide working capital for increased business, and \$100,000 for purchase of additional equipment for airplane manufacture.

Canada Iron Foundries, 227 St. Maurice Street, Three Rivers, Que., will build additions to foundry and machine shops to cost \$100,000.

Winnipeg Electric Railway, Winnipeg, Man., will build substation at Hamel and Des Meurons Street, St. Boniface, Man., for which tenders will be called soon for equipment.

J. E. Bergeron & Son, Ltd., Shawinigan Falls, Que., plan new one-story foundry. Cost about \$50,000 with equipment.

◀ FOREIGN ▶

State Department of Supply and Development, Canberra, New South Wales, Australia, Sir Frederick Stewart, acting minister, plans new works in Lidcombe district, Sydney, New South Wales, for airplane engines, parts production and assembling, storage and distributing buildings, power house and auxiliary structures. Cost close to \$5,000,000 with machinery.

Peno Pobre Papel, S. A., Tlalpan, Mexico, plans new mill for production of paper specialties, including storage and distribution buildings. Cost close to \$200,000 with machinery.

United States Rubber Co., 1790 Broadway, New York, plans new plant at Buenos Aires, Argentine Republic, for production of automobile tires and tubes, and other rubber goods. Cost reported over \$500,000 with machinery. Chauncey S. Garland, industrial engineer at branch mill at Naugatuck, Conn., has been appointed head of one of main production divisions at new plant, which will be completed this year.

Waddington Body Co., Pty., Ltd., Granville, Sydney, New South Wales, Australia, automobile bodies, plans remodeling part of works for an aircraft division, specializing in low-wing metal monoplanes for military service, parts production and assembling. Facilities will be provided for employment of about 1000 men. Cost over \$250,000 with equipment.

\$18,000,000 Building Program

DETROIT—Expenditure of approximately \$18,000,000 in a construction program will be made during 1940 by the Michigan Bell Telephone Co., it has been announced. Approximately \$8,263,000 will be spent in the Detroit division, \$601,000 for a new telephone plant construction in the Upper Peninsula and more than \$9,000,000 for expansion and improvement in the Lower Peninsula outside Detroit. Aside from expenditures for telephonic instruments, more than \$4,000,000 will be spent for central office equipment, more than \$3,100,000 for land and buildings and \$390,000 for general equipment.